2003-05 ENGINE

Engine Mechanical - Repair Procedures - Z4/E85

ENGINE, GENERAL

00 00 250 BMW ENGINE OIL SERVICE INCL. SUPPLEMENTARY SERVICE (M54)

Engine oil service:

Release and tighten down main flow oil filter cap with a socket only.

When the main flow oil filter cap is opened, engine oil flows from the oil filter housing back into the oil sump.

Release main flow oil filter cap and remove towards top.

Installation:

Tightening torque, see 11 42 2AZ in **ENGINE - TIGHTENING TORQUES** .

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Fig. 1: Releasing Main Flow Oil Filter Cap
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace and oil O-ring.

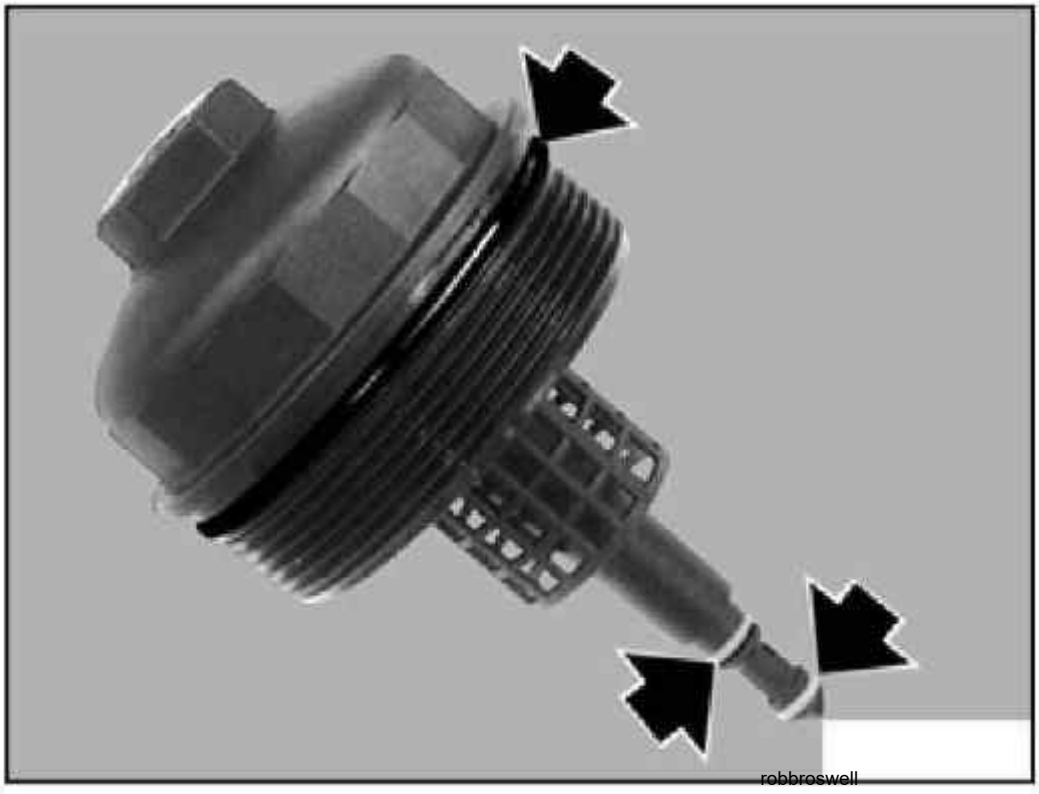


Fig. 2: Removing Oil O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Drain or draw off engine oil.

When engine oil is drained, open cap in engine underguard.

Open oil drain plug and drain off engine oil.

Installation:

Replace sealing ring.

Tightening torque, see 11 13 1AZ **ENGINE - TIGHTENING TORQUES** .

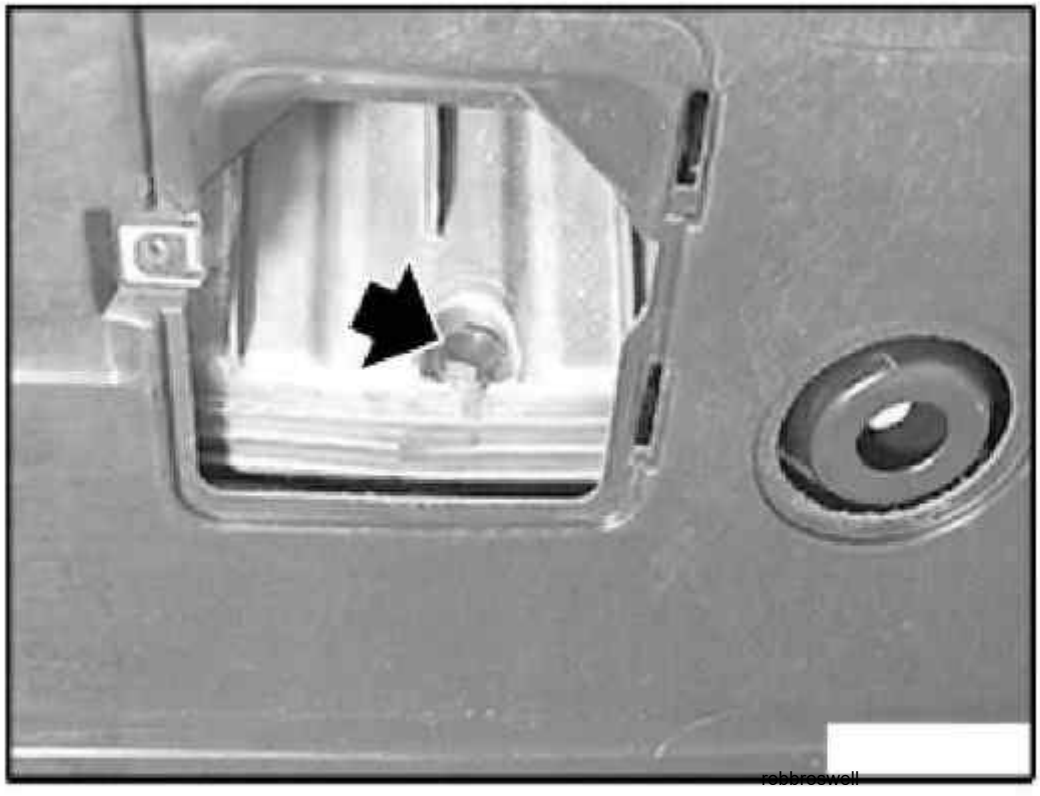


Fig. 3: Identifying Oil Drain Plug
Courtesy of BMW OF NORTH AMERICA, INC.

Complete vehicle and set in horizontal position.

Top up engine oil.

Start engine and run at idle until oil indicator lamp goes out.

Switch off engine, wait approx. 5 minutes and then check engine oil level.

Top up engine oil if necessary.

11 00 039 CHECKING COMPRESSION OF ALL CYLINDERS (M60 / M62 / M73 / S62 / M54)

Special tools required:

- 11 0 224

- 11 0 226

IMPORTANT: High tension - mortal danger!
Cut off power supply to ignition coils (disconnect plug connection at DME control unit).

Necessary preliminary tasks:

- Connect charger or a second battery.
- Read out fault memory of DME control unit
- Pull fuel pump relay or fuel pump fuse.
- Start engine and allow residual fuel to drain out (pressure reduction).
- Remove all spark plugs. See **12 12 011 REPLACING ALL SPARK PLUGS** .

IMPORTANT: Check Schrader valve on special tool 11 0 226 for tight fit.

Screw special tool 11 0 226 by hand into spark plug thread and connect special tool 11 0 224.

NOTE: Check that sealing ring is in perfect condition.

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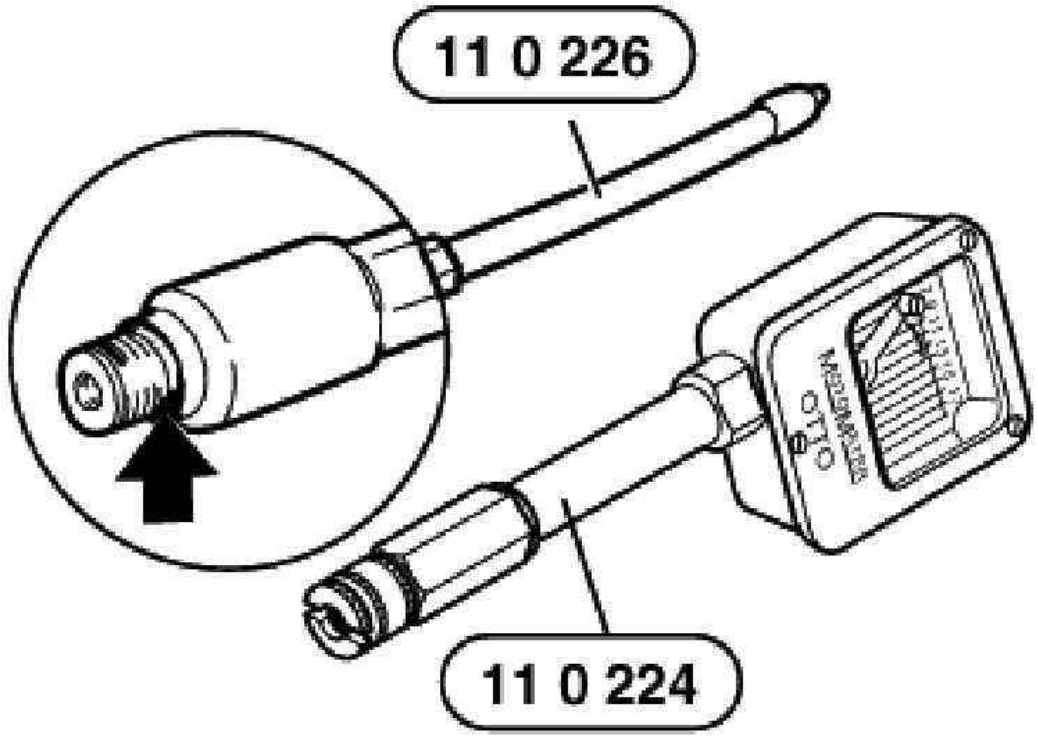


Fig. 4: Installing Special Tool Into Spark Plug Thread
Courtesy of BMW OF NORTH AMERICA, INC.

Depress accelerator and actuate starter until compression stops rising.

Compression pressure.

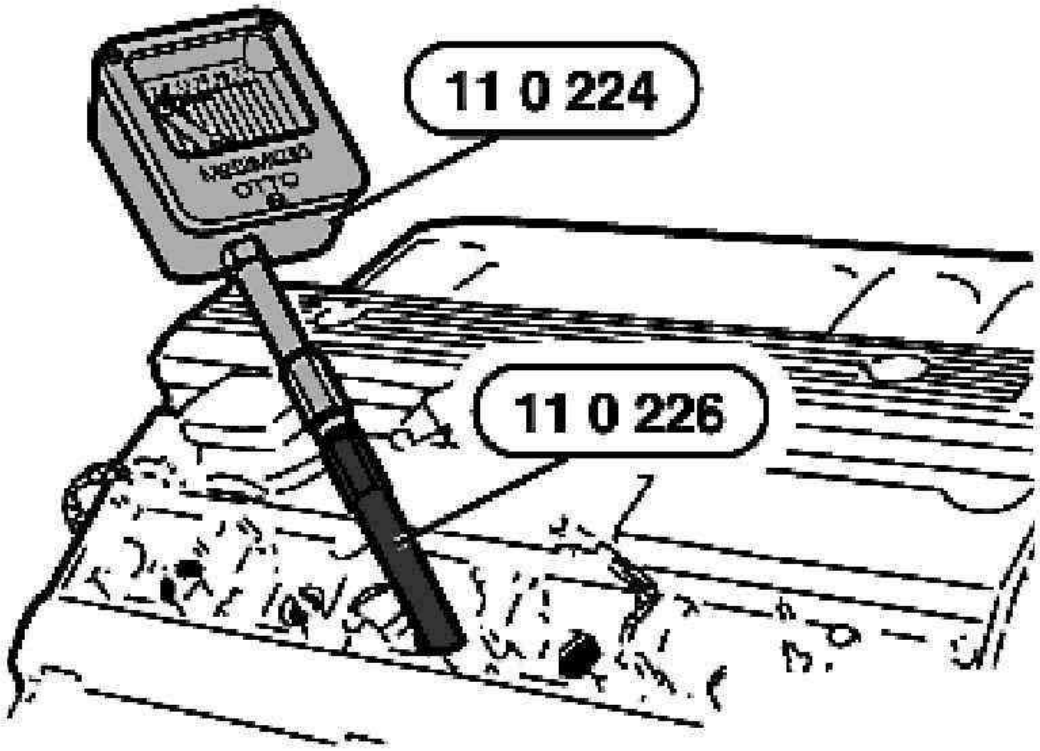


Fig. 5: Checking Compression Pressure
Courtesy of BMW OF NORTH AMERICA, INC.

Assemble engine.

Now clear the fault memory.

11 00 045 CHECKING ABSOLUTE COMPRESSION OF ALL CYLINDERS

With BMW Diagnosis Information System (DIS).



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Fig. 6: Identifying BMW Diagnosis Information System
Courtesy of BMW OF NORTH AMERICA, INC.

- Connect DIS tester

- BMW measuring technology
- Preset measurements
- Absolute compression
- Clear fault memory

11 00 050 REMOVING AND INSTALLING ENGINE (M54)

Special tools required:

- 11 0 020
- 51 2 170

Disconnect negative battery lead.

Exhaust manifold 1-3 remains on engine during removal.

Observe specified tightening torque and safety precautions in all work steps.

Move engine hood into assembly position with special tool 51 2 170.

REMOVING AND INSTALLING ENGINE

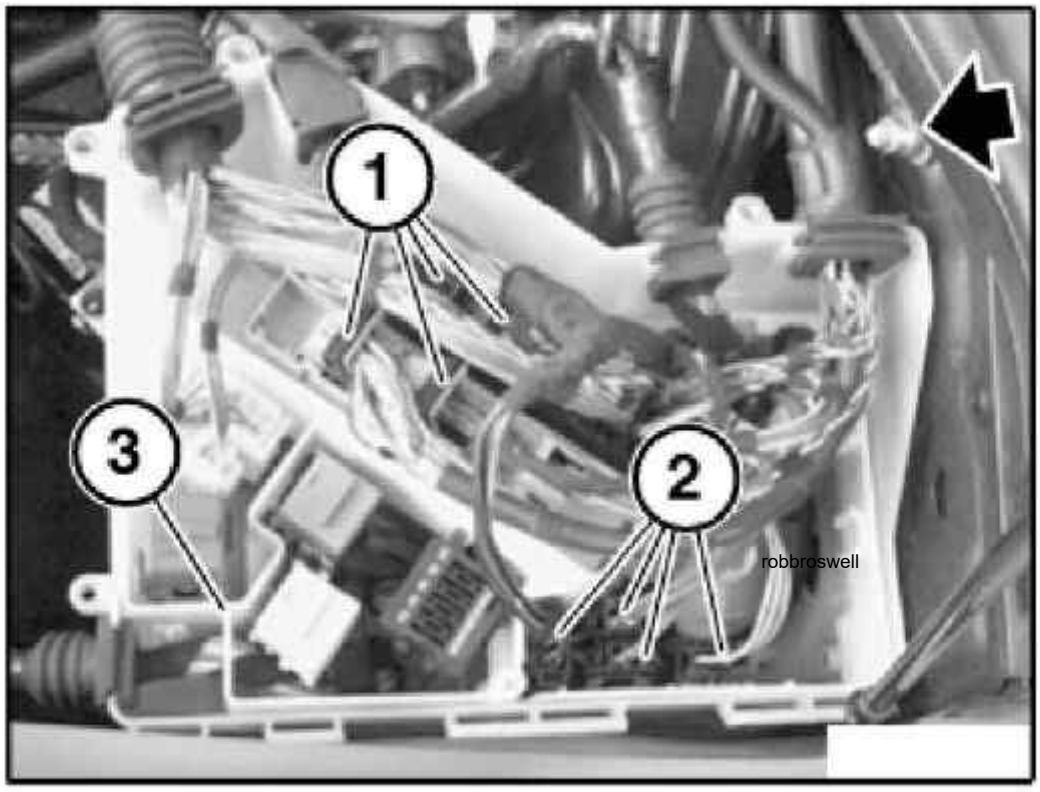
Work step	Note:
Remove gearbox **REMOVAL & INSTALLATION (S5D 200G/S5D 250G/M52** or **REMOVAL & INSTALLATION (GS6S37BZ SMG)** .	After removing transmission, secure engine against tilting.
Remove intake filter housing	
Remove **FAN COWL** ,	
. Remove both tension struts . See **51 23 265 REMOVING AND INSTALLING/REPLACING LEFT AND RIGHT GAS STRUT SHOCKS** .	
Unlock and disconnect plug on exhaust camshaft solenoid valve.	Due to risk of damage when lifting engine out.
Drain coolant from radiator, expansion tank and engine block. See **17 00 005 DRAINING OFF AND TOPPING UP COOLANT** .	
Disconnect coolant hose for heater.	
Unlock coolant hoses and remove.	
Unlock vacuum hose from suction jet pump and detach.	
Disconnect battery positive lead at positive terminal.	

Remove electronics box cover.

Unlock and detach plug connections (1 and 2).

Release nut and remove grounding cable.

Pull relay carrier (3) completely up and out of electronics box.



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Fig. 7: Disconnecting Plug Connections
Courtesy of BMW OF NORTH AMERICA, INC.

REMOVING AND INSTALLING ENGINE

Remove air pump .	
Pump back fuel and unlock and disconnect fuel line.	
Unlock line on tank venting valve and disconnect.	
Remove both oxygen control sensors . See **Emission Control, Oxygen Sensor**	
Remove both oxygen monitor sensors See **Emission Control, Oxygen Sensor**.	

Remove right heat shields.	
Release negative lead on engine support arm.	
Remove **A/C COMPRESSOR DRIVE BELT** .	
Release A/C compressor on bracket, lines remain connected, do not evacuate A/C system.	Do not remove A/C compressor, secure against falling down.
Remove exhaust manifolds 4-6.	With the transmission removed, exhaust manifold 4-6 can be removed without removing exhaust manifold 1-3. Engine support arm can remain on engine.
Suspend engine from special tool 11 0 020 and secure with lifting gear. Release engine mounts on left and right from above. Lift out engine slowly and carefully.	Carry out removal of engine with assistance of a second person.

Installation:

Observe specified tightening torque and safety precautions in all work steps.

CYLINDER HEAD WITH COVER

11 12 000 REMOVING AND INSTALLING, SEALING CYLINDER HEAD COVER (M52TU / M54 / M56)

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Remove engine cover.

Remove **12 13 511 IGNITION COILS (M54)** .

Remove wiring harness of ignition coils from cylinder head cover and place to one side.

NOTE: Illustrations are from an M54 engine.

Press lock.

Pull off the hose for the engine breather.

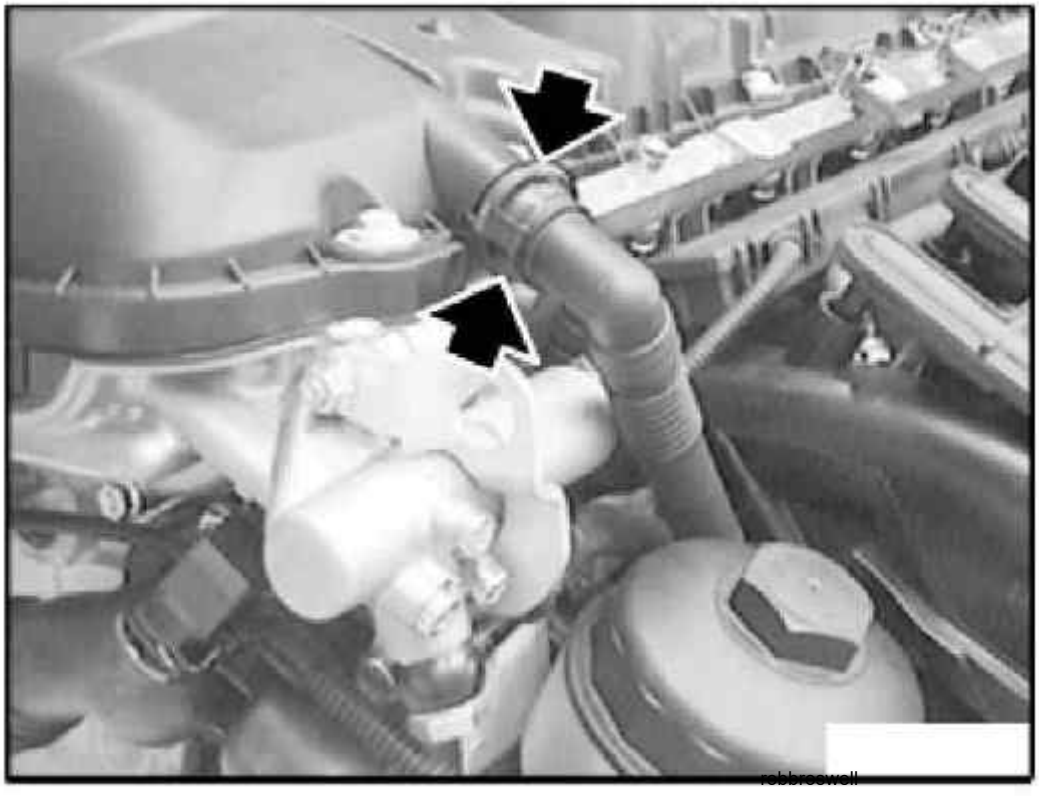


Fig. 8: Disconnecting Hose For Engine Breather
Courtesy of BMW OF NORTH AMERICA, INC.

Remove grounding straps (1).

Remove cylinder head cover.

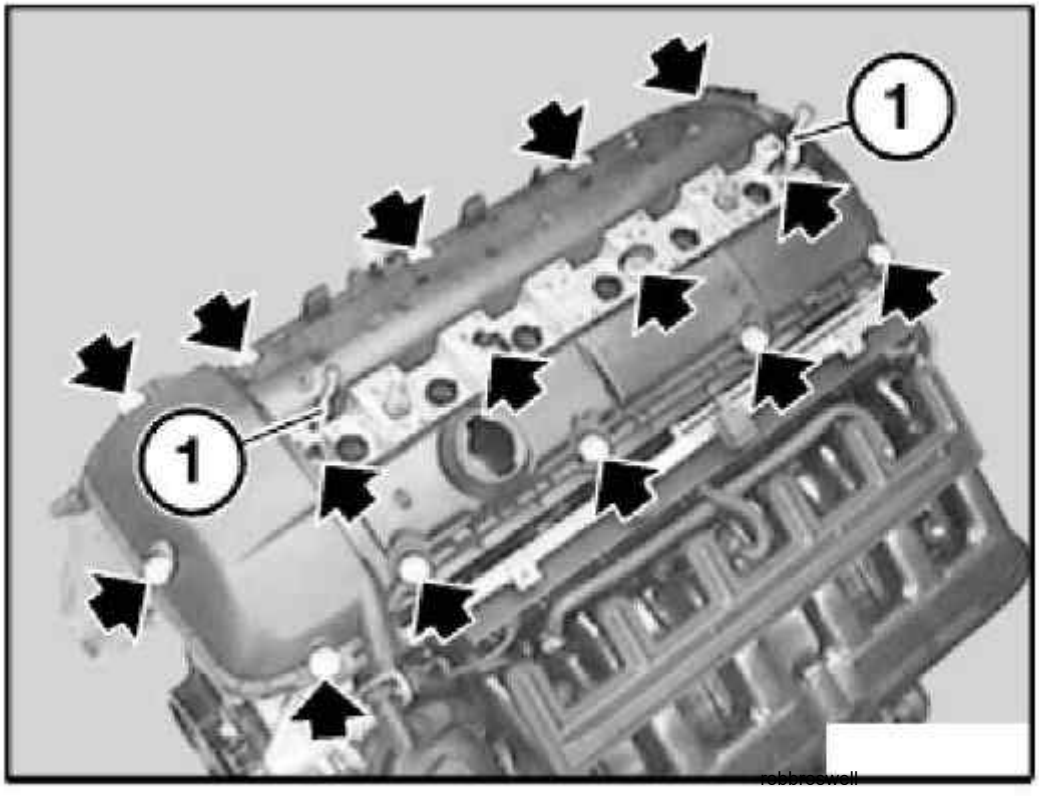


Fig. 9: Removing Grounding Straps
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Remove sealing debris from sealing faces of cylinder head and cylinder head cover.

Apply a sealing bead of Drei Bond 1209 on left and right sides at transition between cylinder head and VANOS adjustment unit.

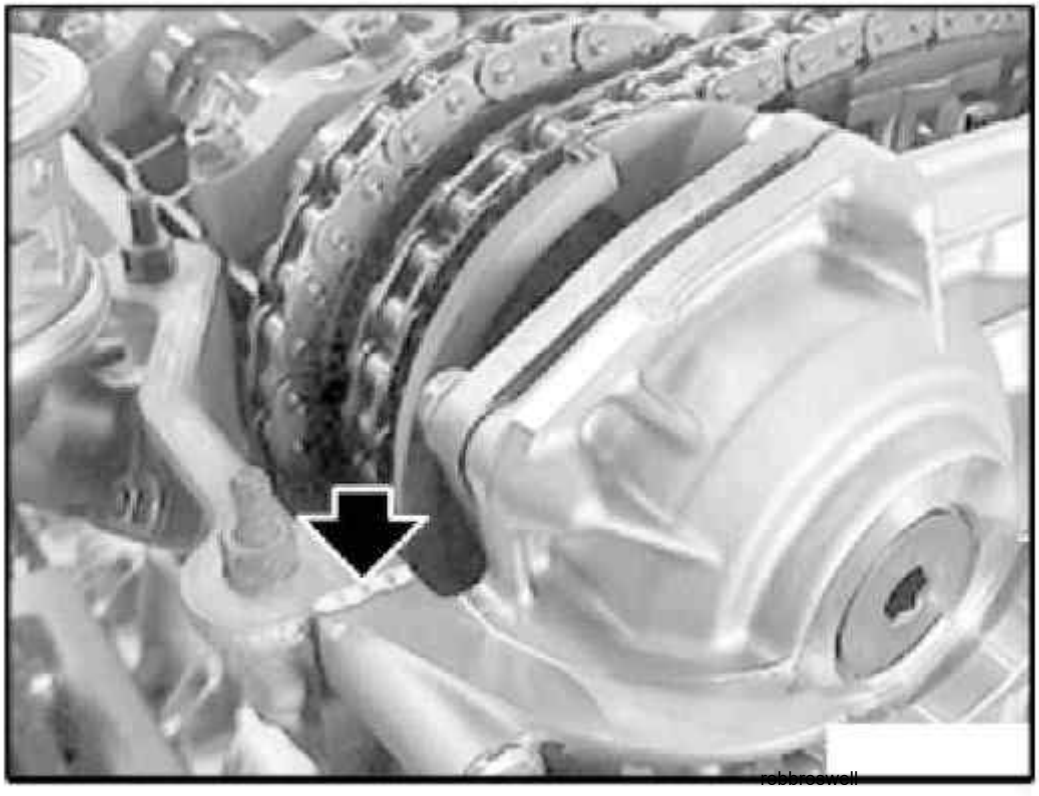
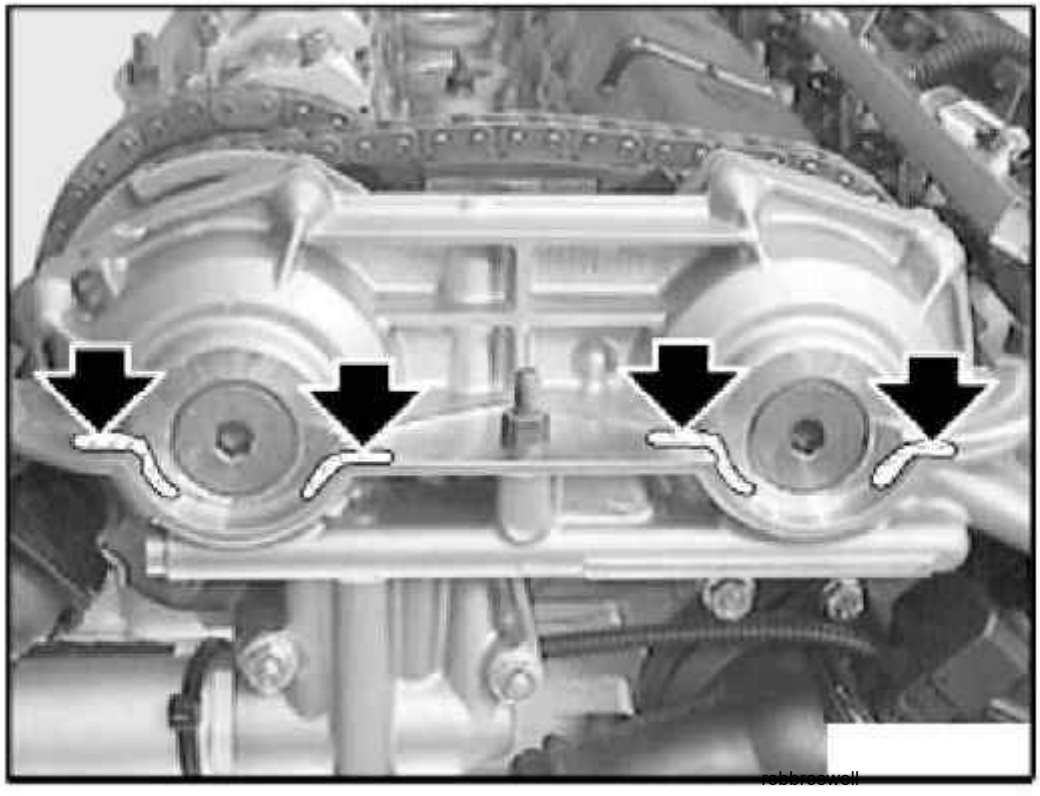


Fig. 10: Applying Sealing Bead Of Drei Bond
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Apply a thin and even sealing bead of Drei Bond at transition to half-moon sections at VANOS adjustment unit.



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Fig. 11: Applying Thin And Even Sealing Bead Of Drei Bond
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Installation:

Apply a thin and even sealing bead of Drei Bond at transition to half-moon sections at rear of cylinder head.

Check seals and replace if necessary.

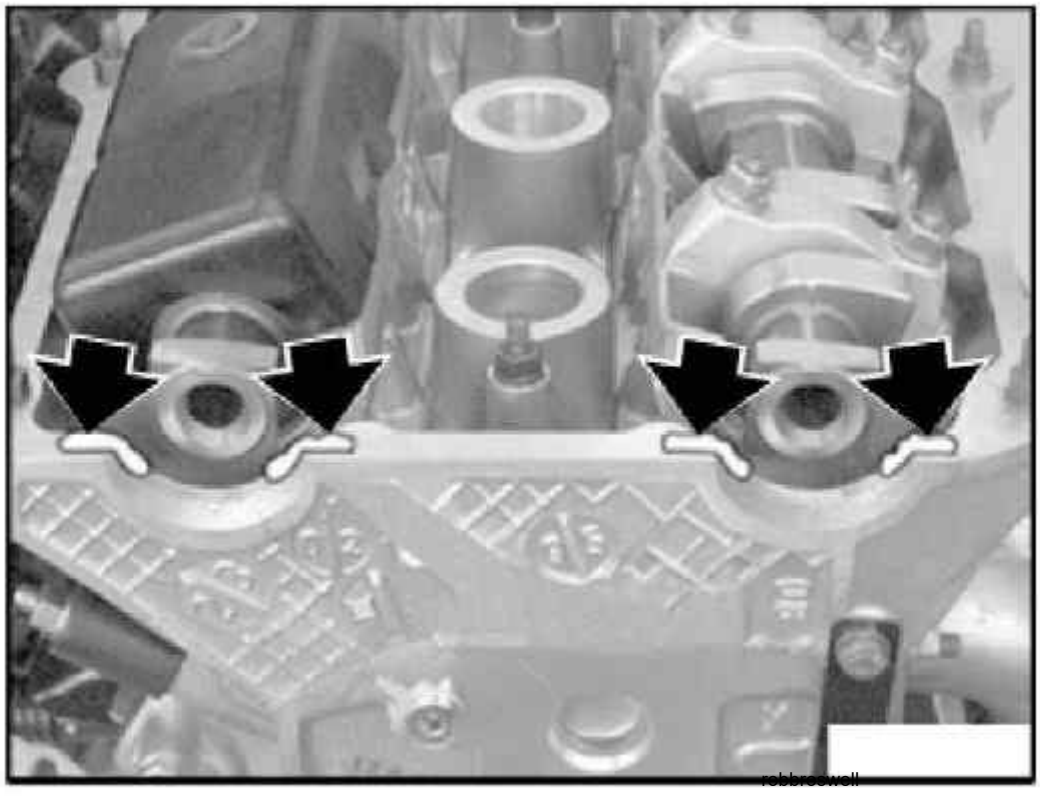


Fig. 12: Checking Seals
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Illustration with engine removed.

Installation:

Make sure gasket is correctly seated on rear and front ends of cylinder head.

Install cover bolts and align cylinder head cover.

Hand-tighten all cover bolts without preload. Tighten cap nuts crosswise from inside to outside.

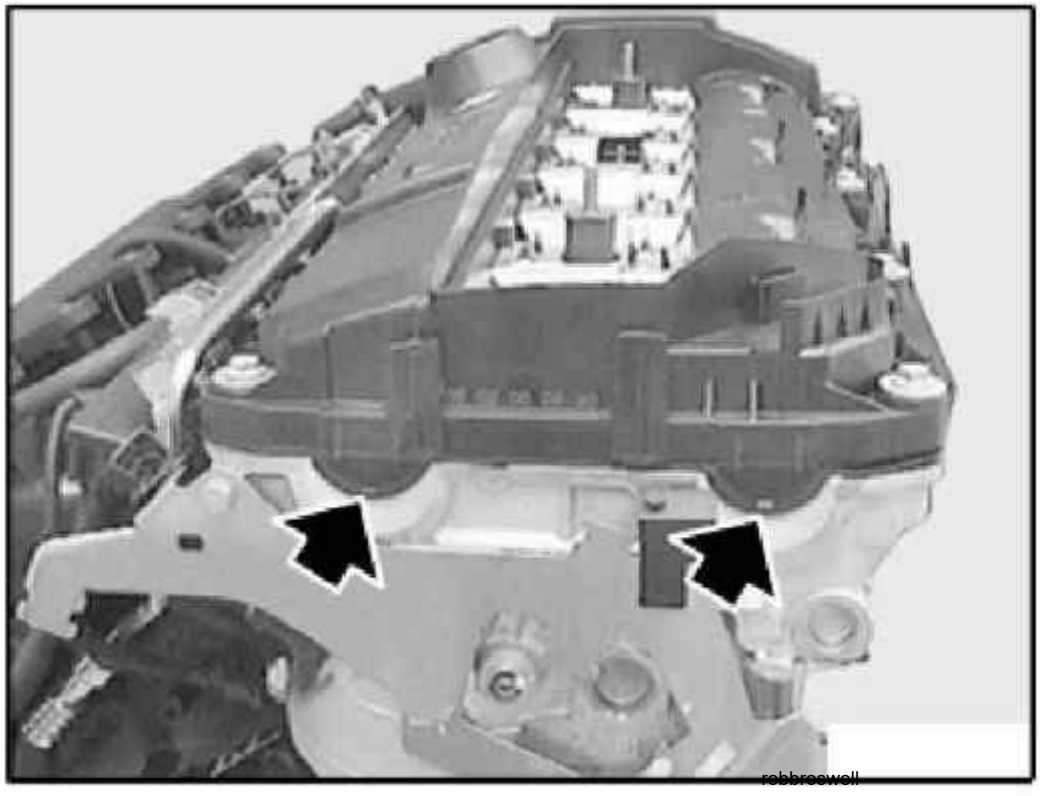


Fig. 13: Installing Cover Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 100 REMOVING AND INSTALLING/REPLACING CYLINDER HEAD (M52TU / M54 / M56)

Special tools required:

- 00 0 200
- 00 9 120

Remove both exhaust manifolds . See **Exhaust Manifold**.

NOTE: After removing exhaust manifolds:

Reinstall engine support arm with engine mount and remove special tool 00 0 200.

Remove intake filter housing with air-mass flow sensor.

Remove cylinder head cover . See **Cylinder Head With Cover**.

Remove all spark plugs. See **12 12 011 REPLACING ALL SPARK PLUGS** .

Remove intake air manifold . See **11 61 050 Removing And Installing Intake Air Manifold (M54)**.

Remove coolant drain plug in engine block. Drain and dispose of coolant.

Installation:

Replace sealing ring on drain plug.

Tightening torque, see 11 11 5AZ in **ENGINE - TIGHTENING TORQUES** .

Vent cooling system and check for leaks . See **17 00 039 VENTING COOLING SYSTEM AND CHECKING FOR LEAKS** .

Remove coolant thermostat housing. . See **Coolant Thermostat**.

Remove coolant pipe.

NOTE: If the coolant pipe cannot be fed out:

Release banjo bolt (1) and disconnect oil pressure line for VANOS adjustment unit.

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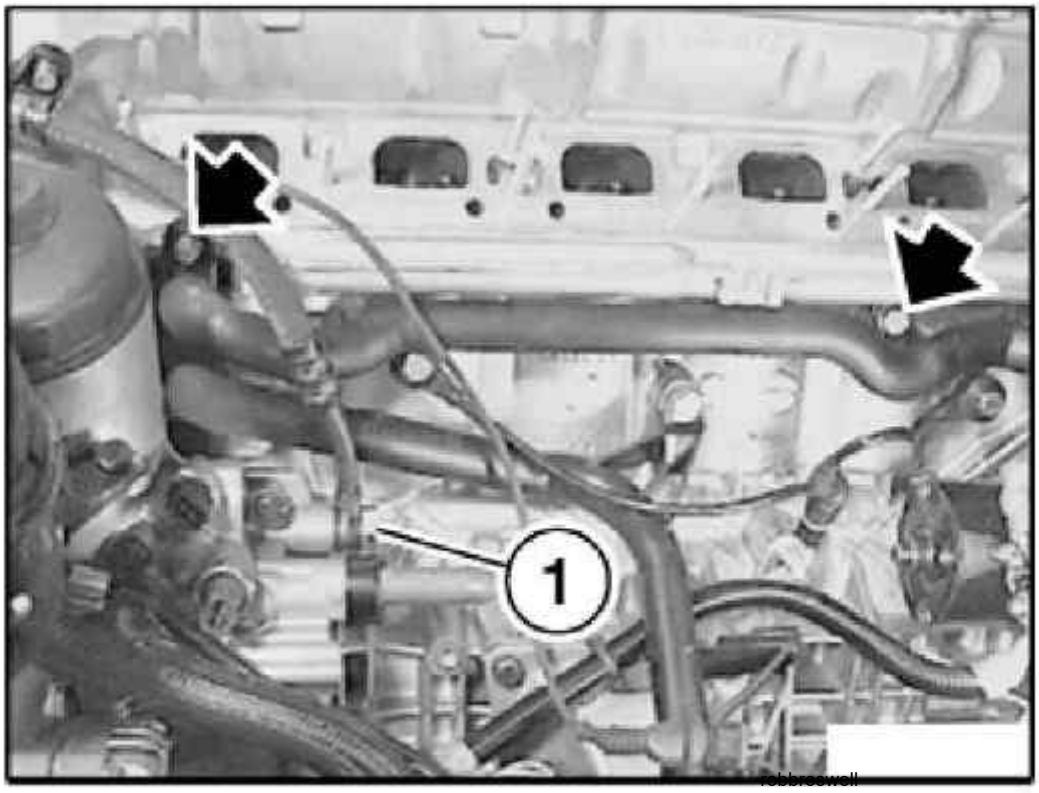


Fig. 14: Removing Banjo Bolt And Disconnecting Oil Pressure Line For VANOS Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring on coolant pipe.

If necessary, replace sealing rings on banjo bolt (1).

Tightening torque of banjo bolt (1), see 11 36 2AZ in **ENGINE - TIGHTENING TORQUES**

Removal

Removal of cylinder head is described separately from installation.

Remove double VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

Remove camshafts with bearing strips . See **11 31 001 Replacing Camshaft (M52TU / M54 / M56)**.

Release screw connection between timing case cover and cylinder head.

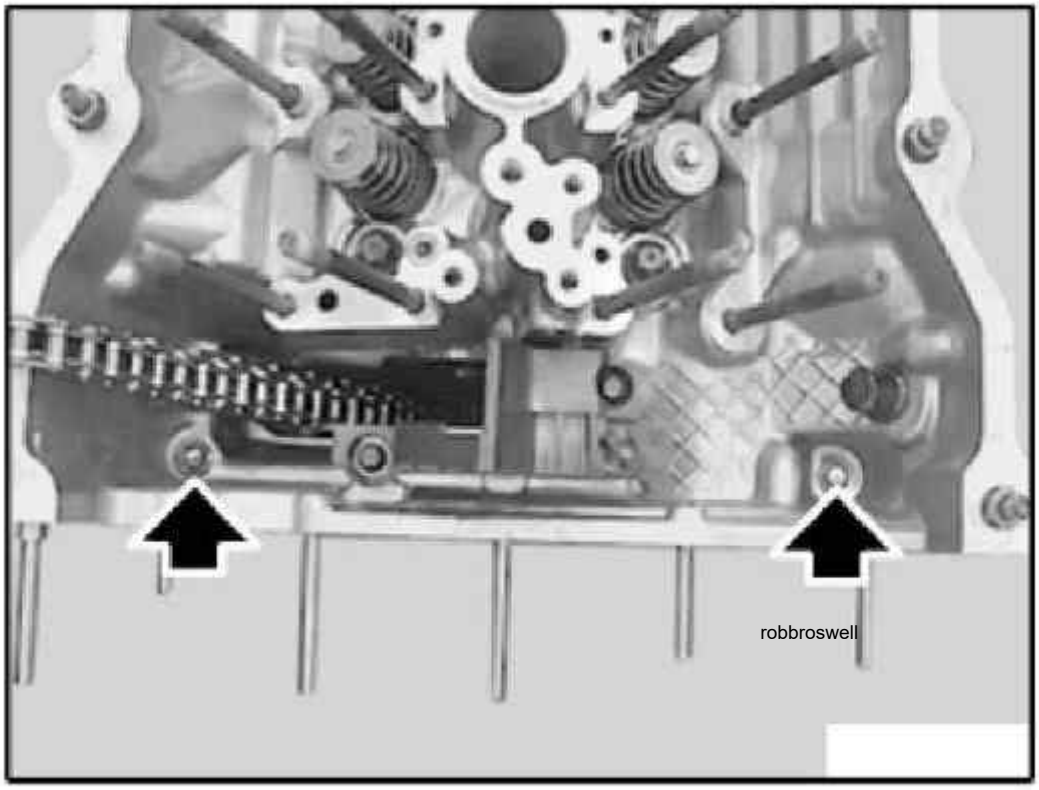


Fig. 15: Releasing Screw Connection Between Timing Case Cover And Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws, remove chain guide.

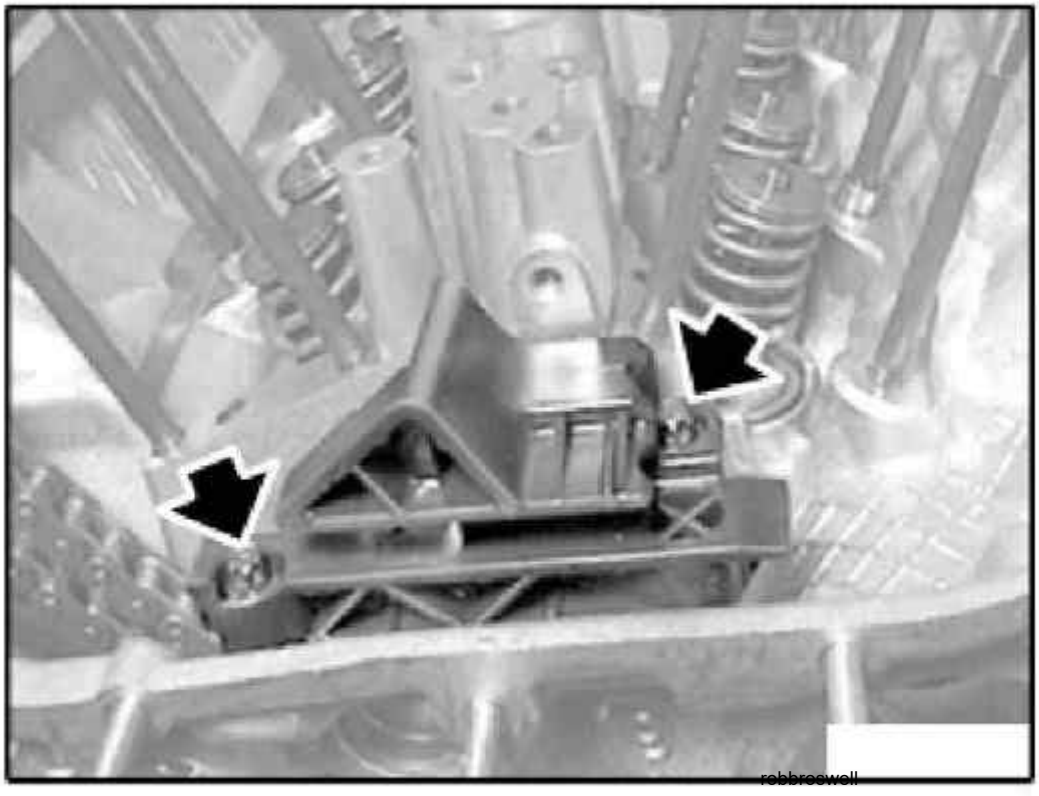


Fig. 16: Removing Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Release cylinder head bolts from outside to inside in sequence 14 to 1.

Lift off cylinder head.

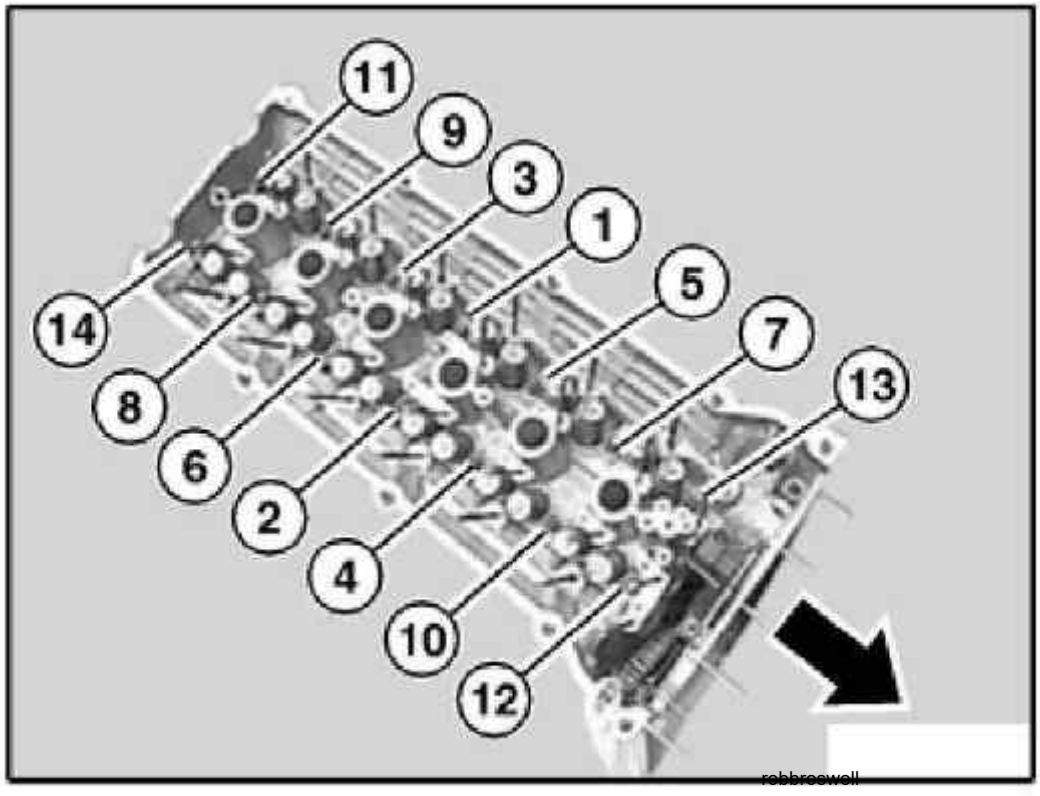


Fig. 17: Cylinder Head Bolt Removal Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of cylinder head is described separately from removal.

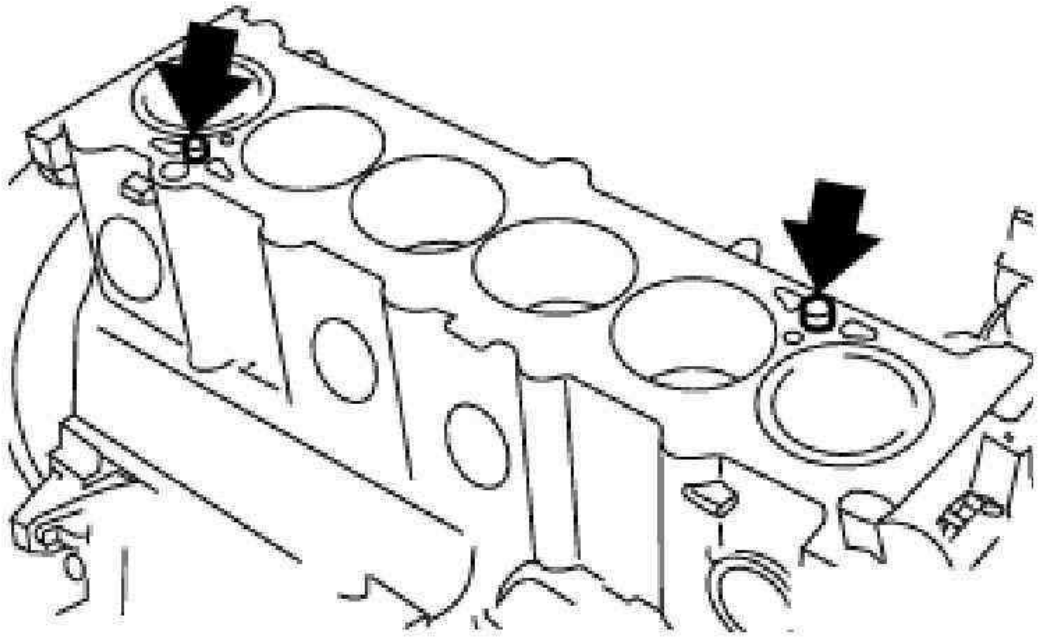
Clean sealing faces of cylinder head and engine block; if necessary, remove traces of gasket with hardwood spatula.

Make sure no gasket remnants drop into oil and cooling channels.

Check adapter sleeves for damage and correct installation position.

Apply permanently elastic sealing compound Drei Bond 1209 to joints to timing case cover.

Replace cylinder head gasket.



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Fig. 18: Applying Elastic Sealing Compound Drei Bond
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: A cylinder head seal 0.3 mm thicker than usual can be obtained for machined (milled) cylinder heads.

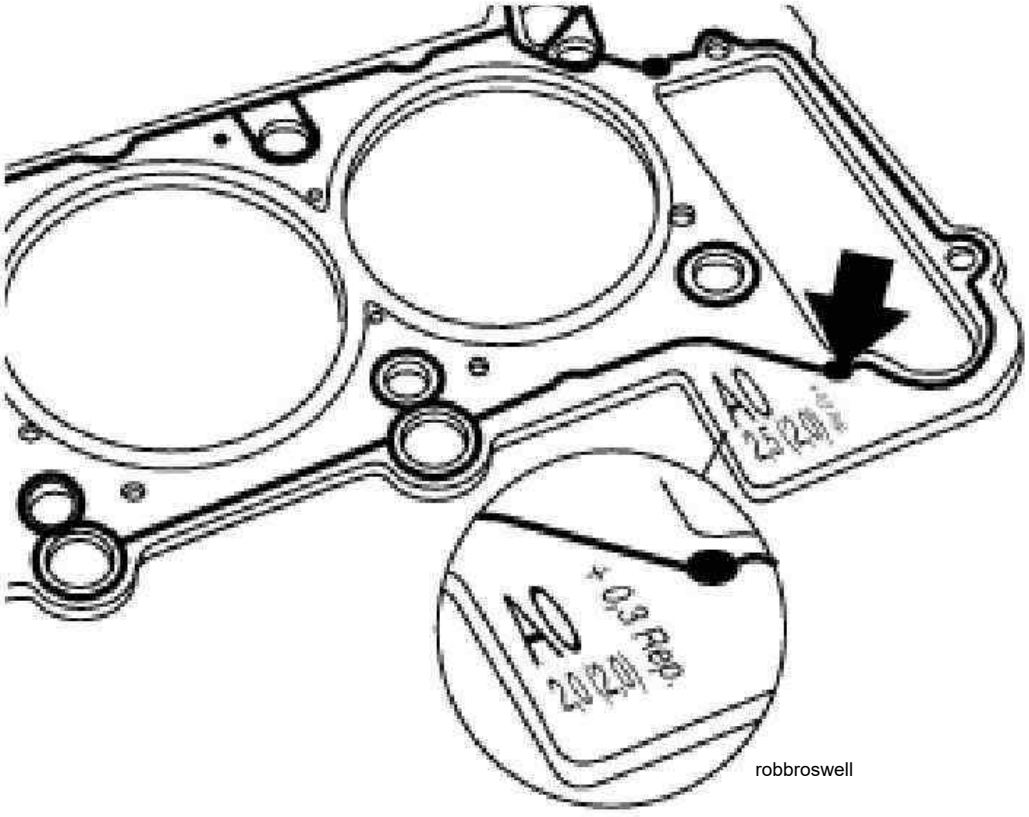


Fig. 19: Identifying Cylinder Head Seal
Courtesy of BMW OF NORTH AMERICA, INC.

CAUTION: Different cylinder head bolts are used for M52TU engine:
M10x95 for engines with cast iron engine block.
M10x110 for engines with aluminum engine block.

Use cylinder head bolts only once.

There must be no oil in the tapped holes of the engine block and the timing case cover.

Risk of cracking and distorted tightening values.

Put the cylinder head on.

Apply a light coat of oil to washer contact area and thread of new cylinder head bolts.

Tighten down cylinder head bolts in sequence 1 to 14.

Tightening torque, see 11 12 6AZ in **ENGINE - TIGHTENING TORQUES** .

NOTE: Use special tool 00 9 120 for torsion angle tightening.

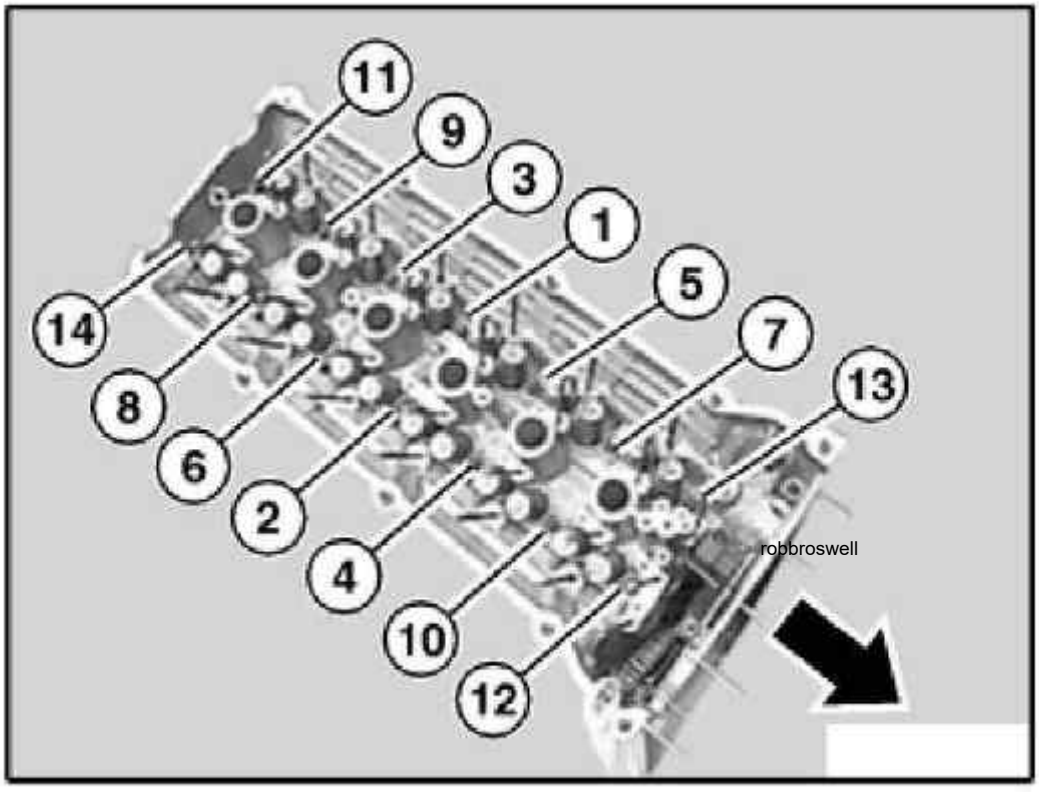


Fig. 20: Tightening Cylinder Head Bolts In Sequence
Courtesy of BMW OF NORTH AMERICA, INC.

Install chain guide.

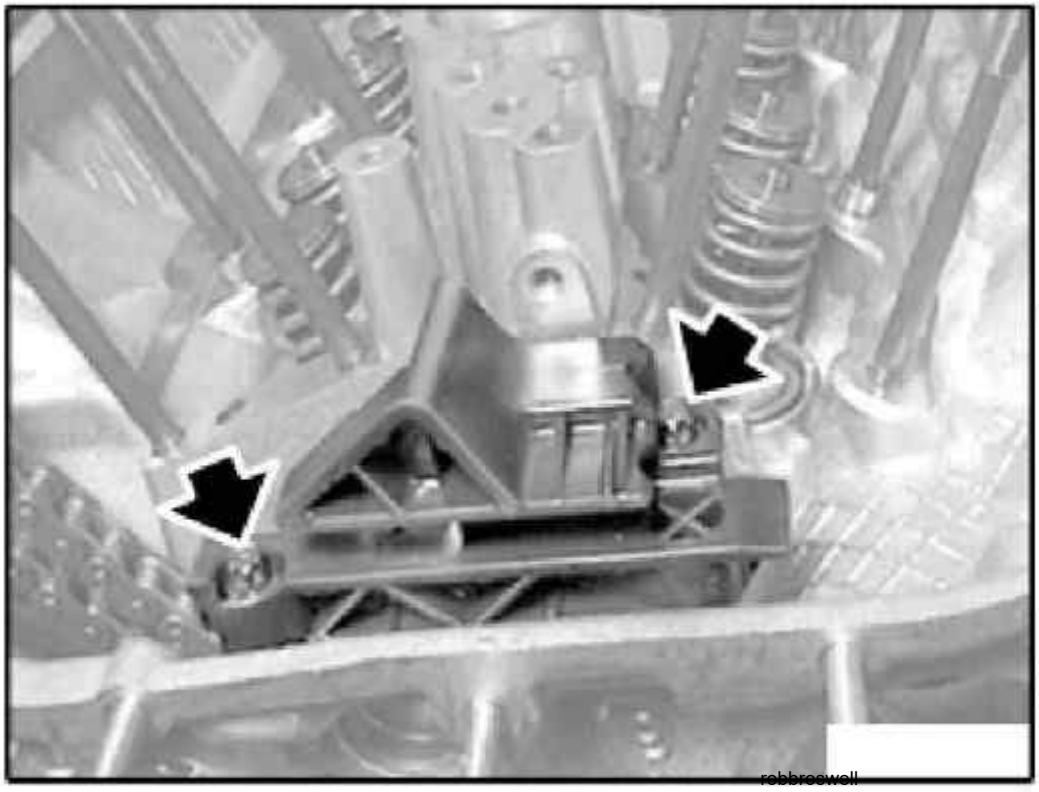


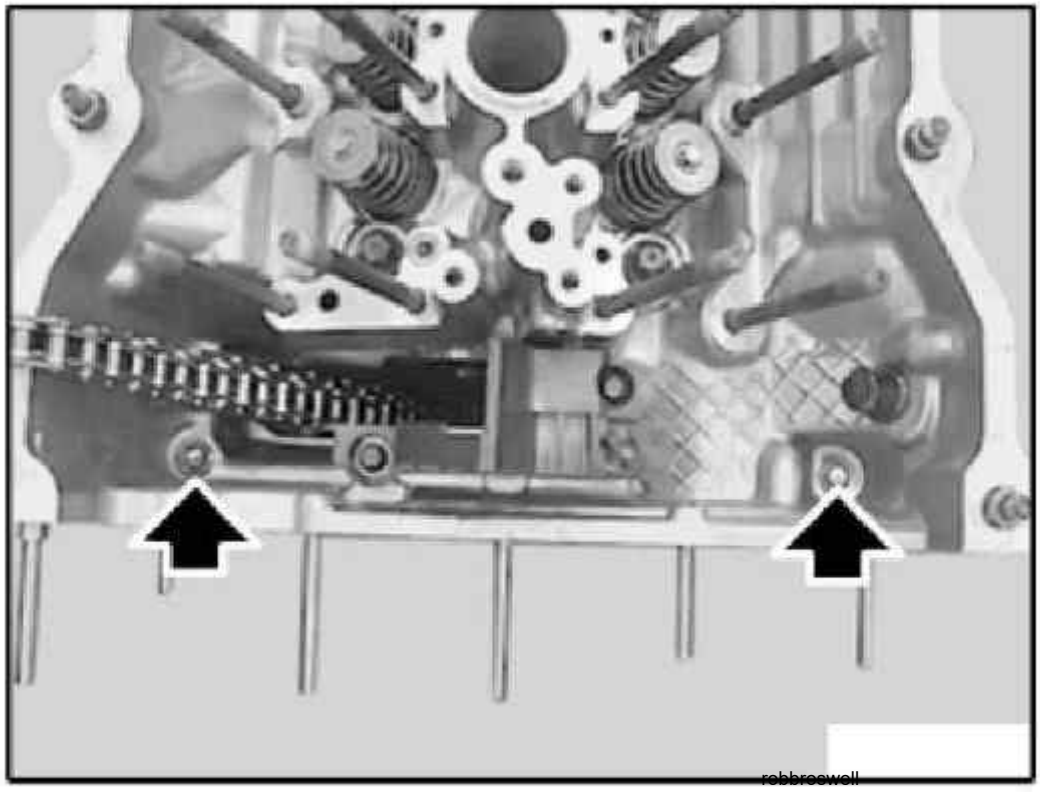
Fig. 21: Installing Chain Guide
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws and tighten down screw connection between timing case cover and cylinder head.

Install camshafts . See **11 31 001 Replacing Camshaft (M52TU / M54 / M56)**.

Install double VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

Assemble engine.



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Fig. 22: Tightening Screw Connection Between Timing Case Cover And Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 101 REPLACING CYLINDER HEAD GASKET (M52 / S52 / M52TU / M54 / M56)

Tasks are identical to Removing and installing cylinder head . See **Cylinder Head With Cover**.

11 12 503 DISASSEMBLING AND ASSEMBLING CYLINDER HEAD (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 00 1 490
- 11 0 192
- 11 0 342
- 11 0 343
- 11 0 345

- 11 1 045
- 11 1 065
- 11 1 067
- 11 1 071
- 11 1 441
- 11 1 442

(cylinder head removed)

If necessary, remove coolant thermostat. See **Coolant Thermostat**.

Screw on special tool 11 1 442.

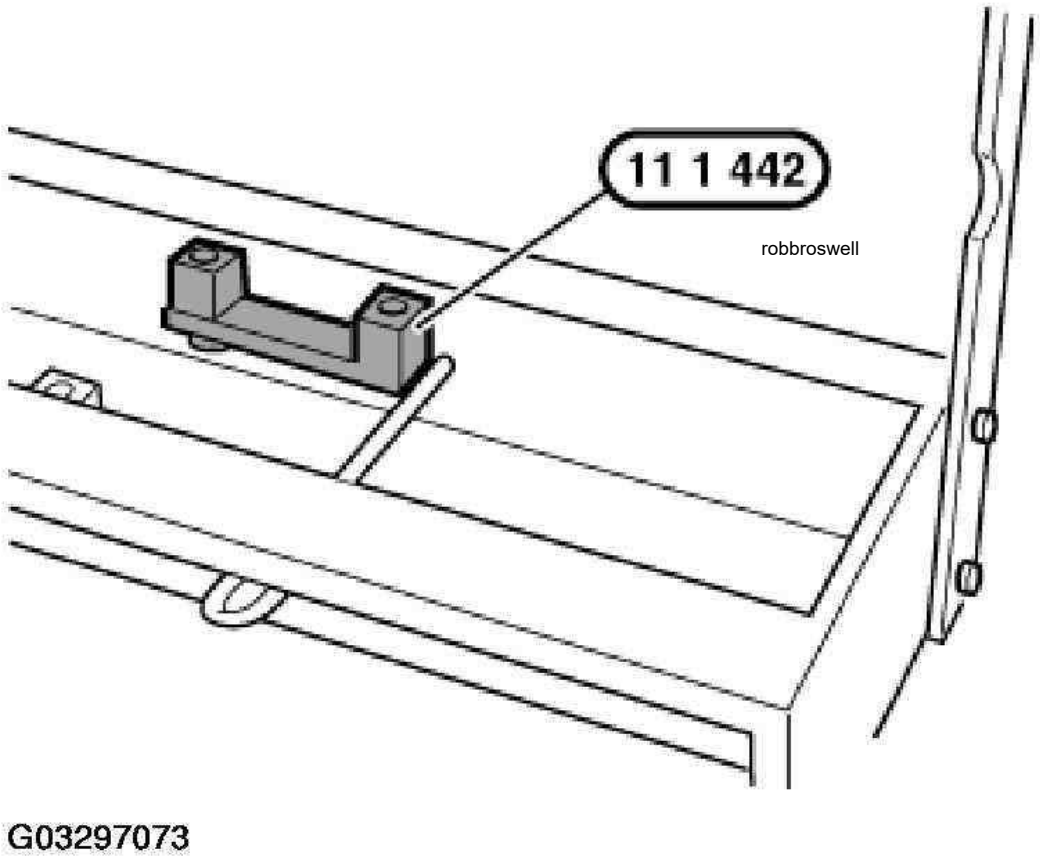


Fig. 23: Installing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Screw special tool 11 1 065 onto special tool 00 1 490.

Provide special tools for disassembling cylinder head:

- special tool 11 1 071
- special tool 11 1 067
- special tool 11 0 192

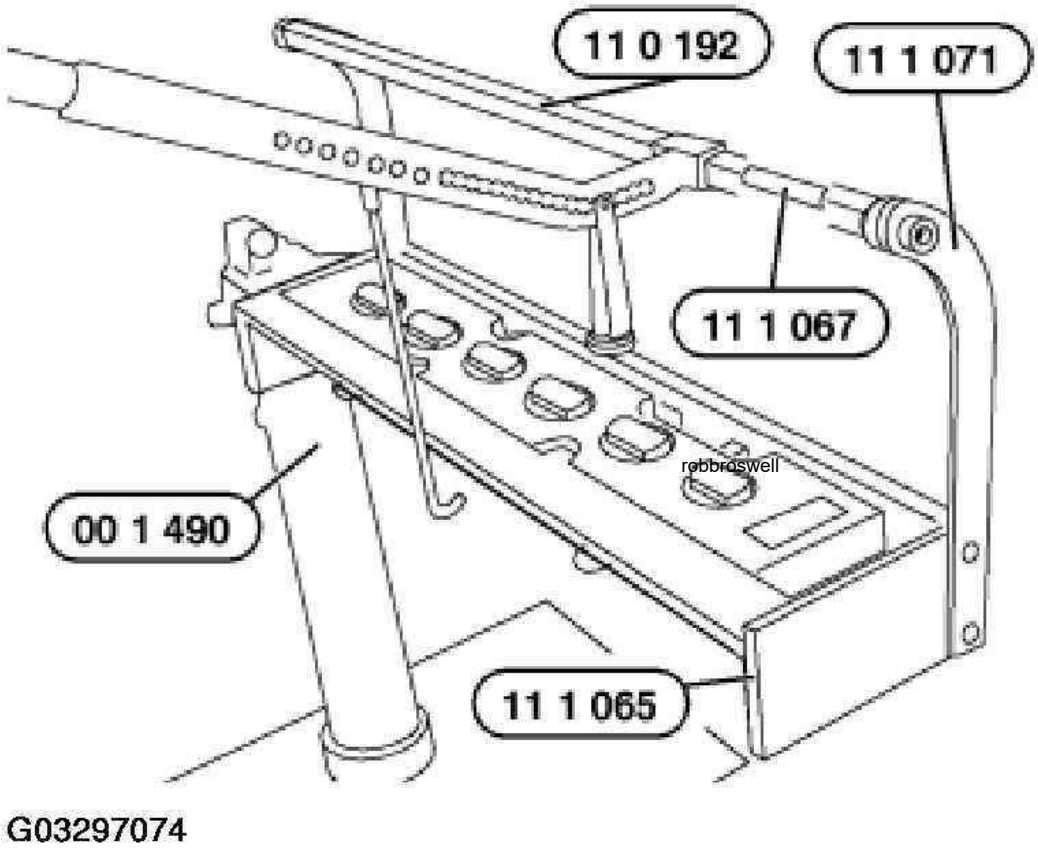


Fig. 24: Installing Special Tool Onto Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

- special tool 11 1 045
- special tool 11 0 342
- special tool 11 0 343
- special tool 11 0 345
- special tool 11 1 441

Assemble special tools.

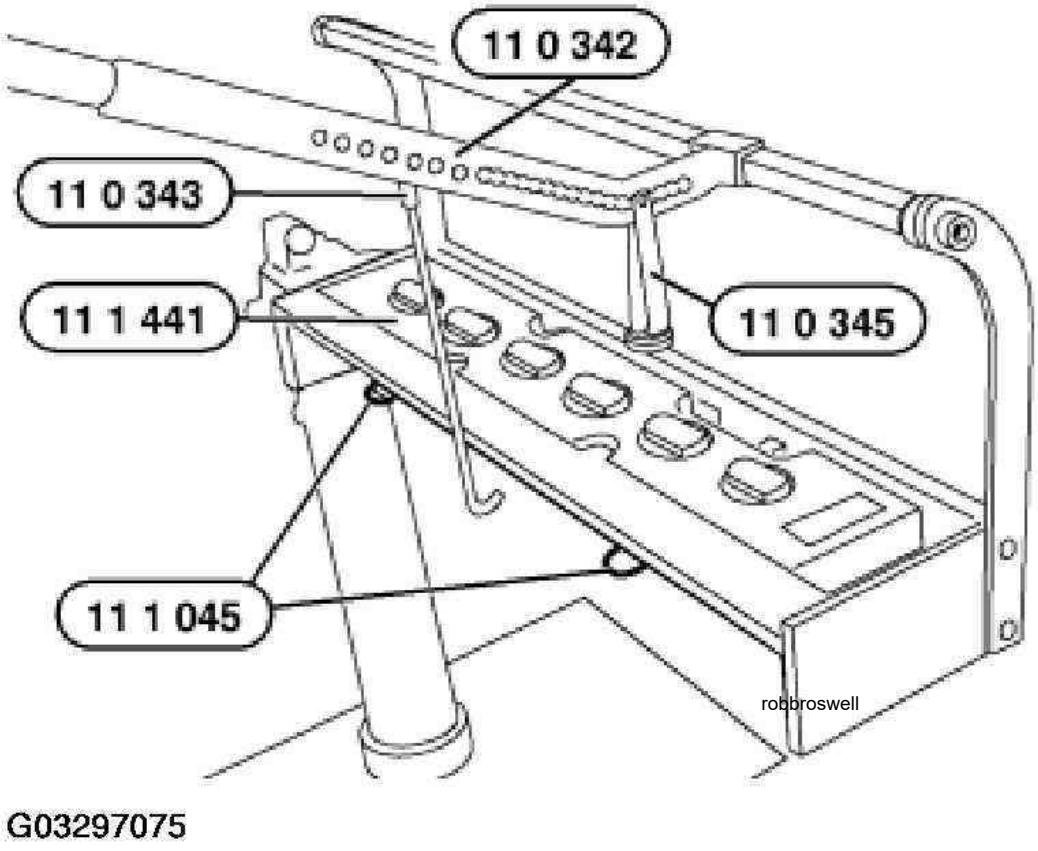


Fig. 25: Assembling Special Tools
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Do not install special tool 11 1 441 (locating board) in special tool 11 1 065 at this stage.

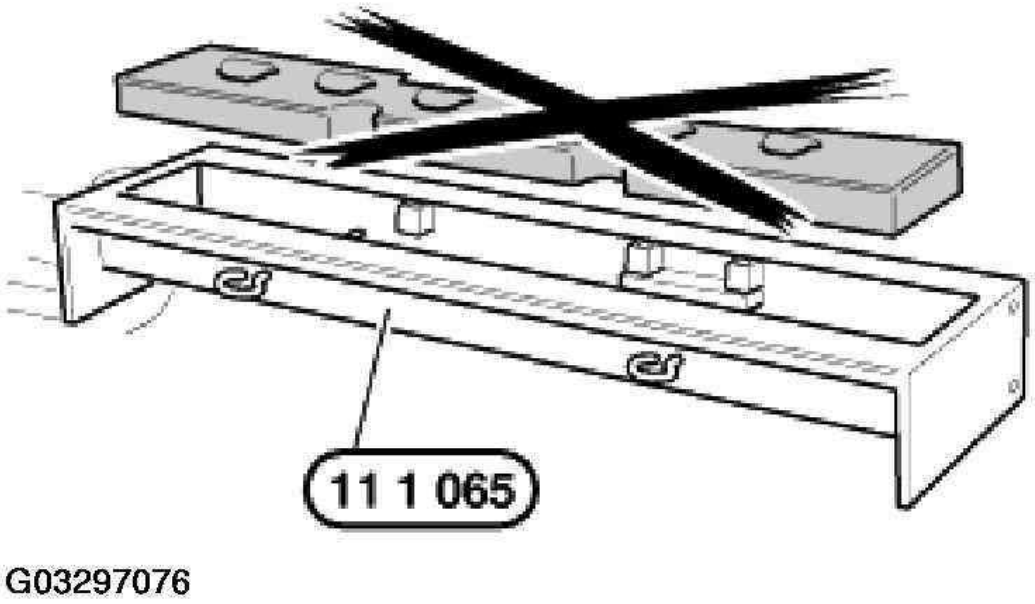
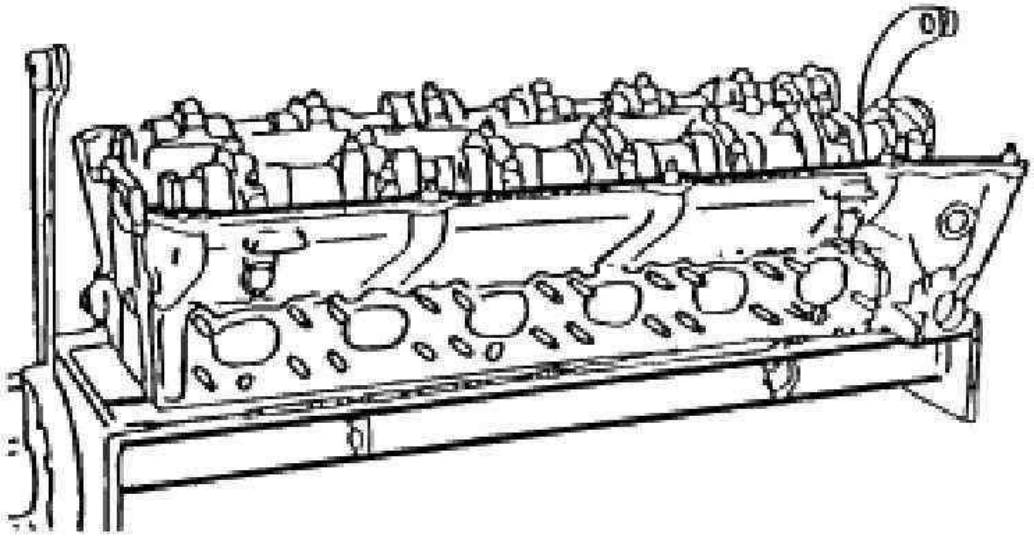


Fig. 26: Identifying Safety Precaution
Courtesy of BMW OF NORTH AMERICA, INC. robbroswell

Place cylinder head on special tool 11 1 065 and screw on with two screws.



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Fig. 27: Placing Cylinder Head On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC. robbroswell

Remove all valve springs . See **11 34 715 Replacing All Valve Springs (M52 / S52 / M52TU / M54 / M56)**.

Remove all valve stem seals . See **11 34 560 Replacing All Valve Stem Seals (M52 / S52 / M52TU / M54 / M56)**.

Remove all valves . See **11 34 552 Removing And Installing Or Replacing All Valves (M52 / S52 / M52TU / M54 / M56)**.

11 12 527 REMACHINING A VALVE SEAT (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 00 3 520
- 00 3 580

(cylinder head dismantled)

Machine valve seat surface with special tool 00 3 520 or with special tool 00 3 580 in accordance with manufacturer's instructions.

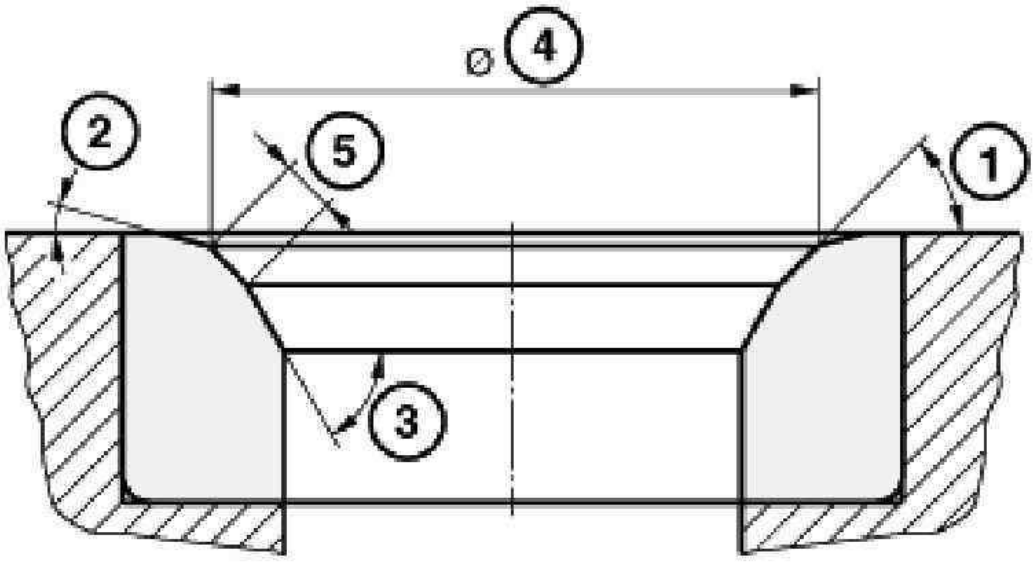


Fig. 28: Machining Valve Seat Surface With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: After machining the valve seat surface, remachine the outside and inside diameters with a correction milling tool to the prespecified diameter to produce valve seat width (5).

1. Valve-seat angle
2. Correction angle, outside
3. Correction angle, inside
4. Outside diameter seat face
5. Valve-seat width

Specified values (1 to 5) . See **Fig. 29**.



1) Valve-seat angle
2) Correction angle, outside
3) Correction angle, inside
4) Outside diameter seat face
5) Valve-seat width

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Fig. 29: Identifying Machining Of Valve Seat Surface
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 595 CHECKING A VALVE GUIDE FOR WEAR (M52 / S52 / M52TU / M54 / M56)

(valve removed)

To measure tilt clearance, install a new valve so that end of valve stem is flush with valve guide.

Attach dial gauge and measure tilt clearance.

NOTE: Max. permissible tilt clearance.

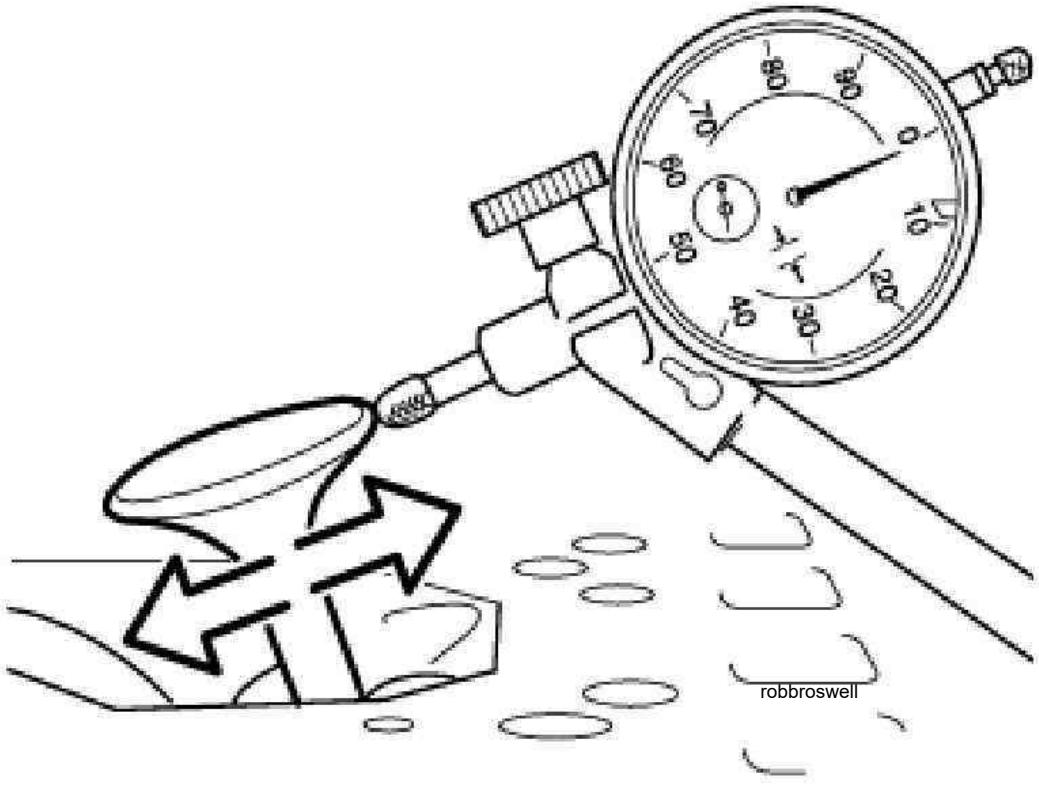


Fig. 30: Checking Valve Guide For Wear
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If tilt clearance is excessive, valve guide is reamed out and a repair valve with a larger shaft diameter is installed.

If necessary, ream valve guide . See **11 12 600 Reaming A Valve Guide (M52 / S52 / M52TU / M54 / M56)**.

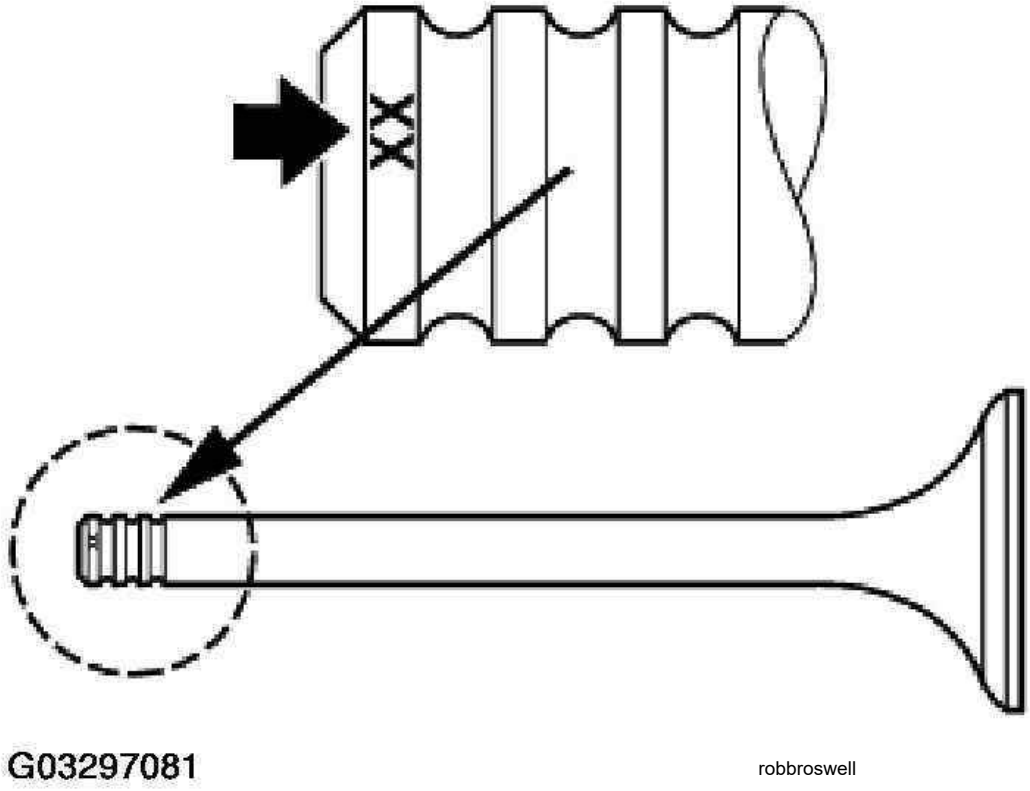


Fig. 31: Identifying Valve With Larger Shaft Diameter
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 600 REAMING A VALVE GUIDE (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 00 4 210

(valve removed)

NOTE: In event of excessive clearance between valve stem and valve guide: Valve guide is reamed and a repair valve with a larger stem diameter is installed.

Assemble reaming tool and guide taper (1) from special tool kit 00 4 210 depending on stem diameter. Press guide taper (1) onto valve seat. Starting from combustion chamber side, ream valve guide dry. Rotate reaming tool once in downwards direction.

NOTE: Remachine valve seat after reaming.

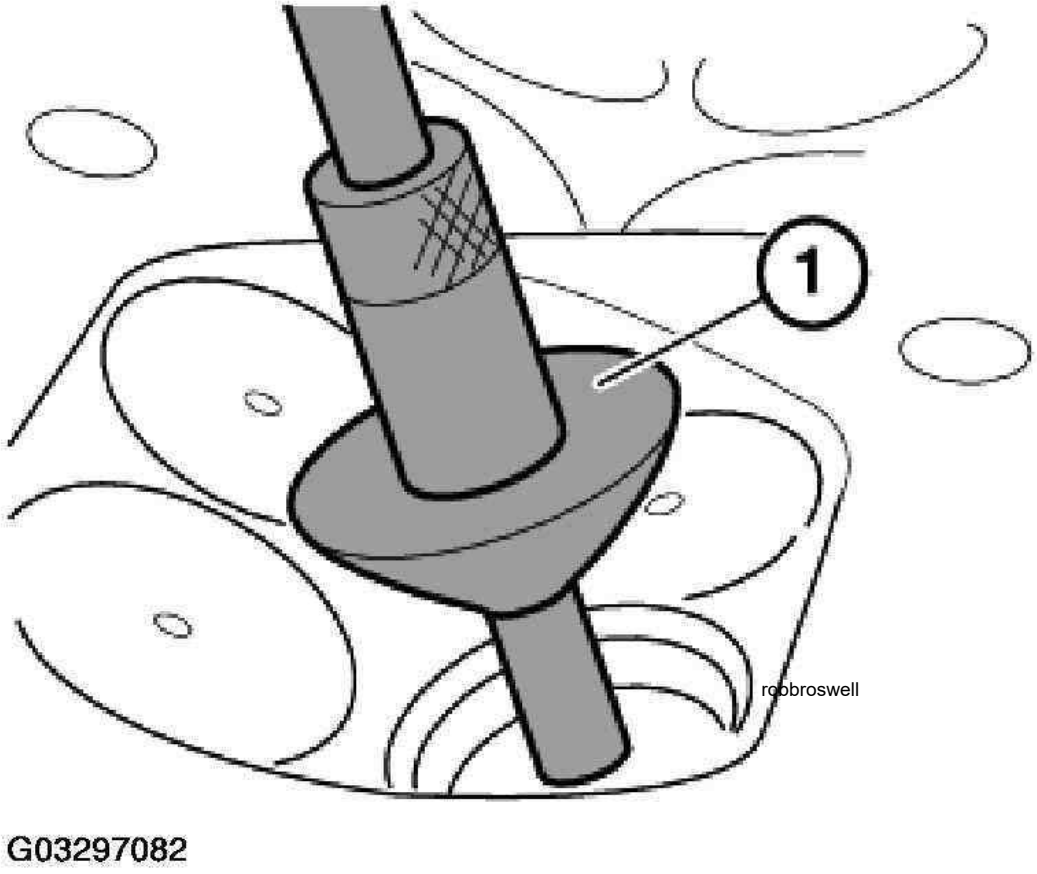


Fig. 32: Assembling Reaming Tool And Guide Taper From Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 719 RESURFACING CYLINDER HEAD SEALING SURFACE (M52 / M52TU / M54 / M56)

(cylinder head dismantled)

Check flatness of cylinder head sealing surface with a commercially available straightedge.

Deviation from flatness max. 0.05 mm.

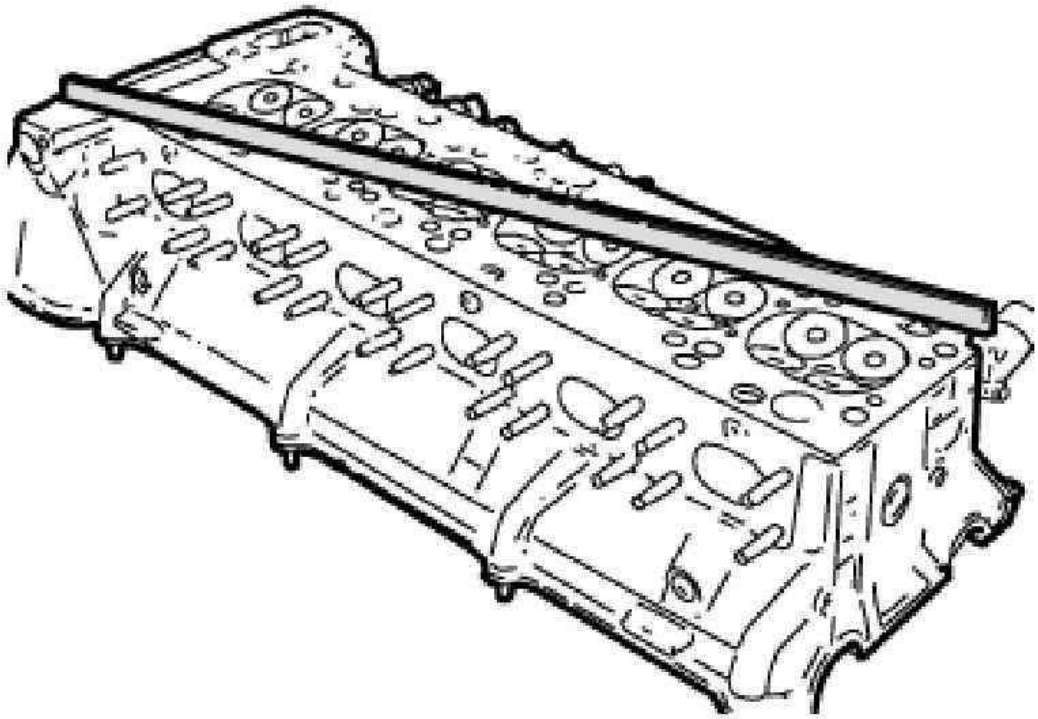


Fig. 33: Checking Flatness Of Cylinder Head Sealing Surface
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Machining limit.

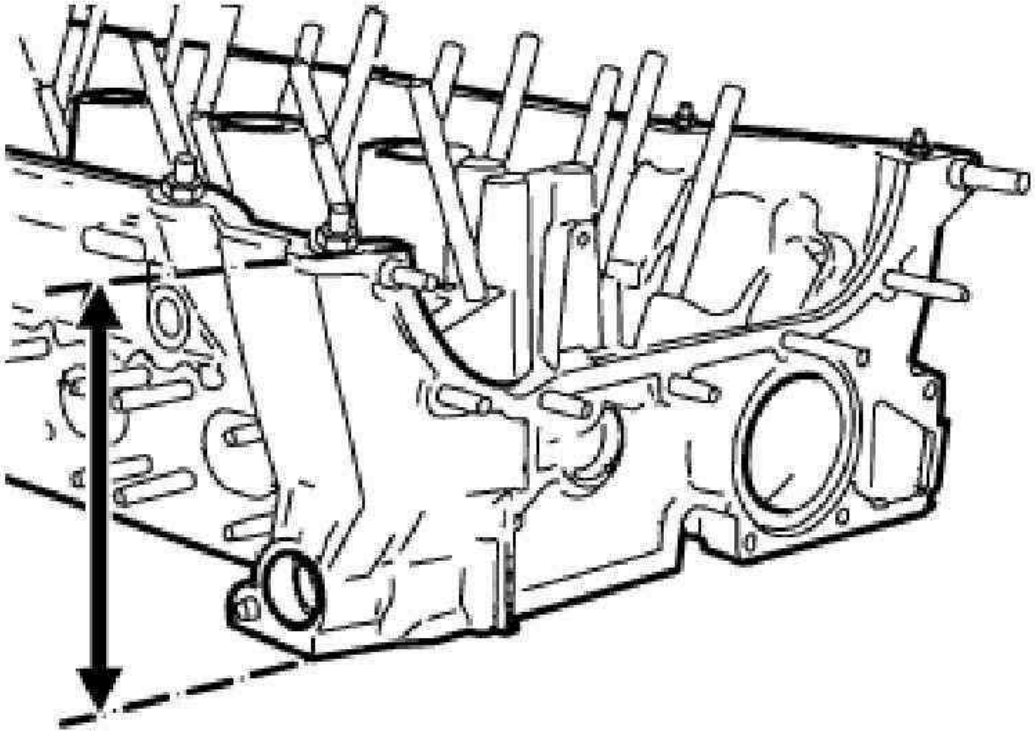


Fig. 34: Identifying Machining Limit
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For compression comparison check, a repair cylinder head seal is provided.

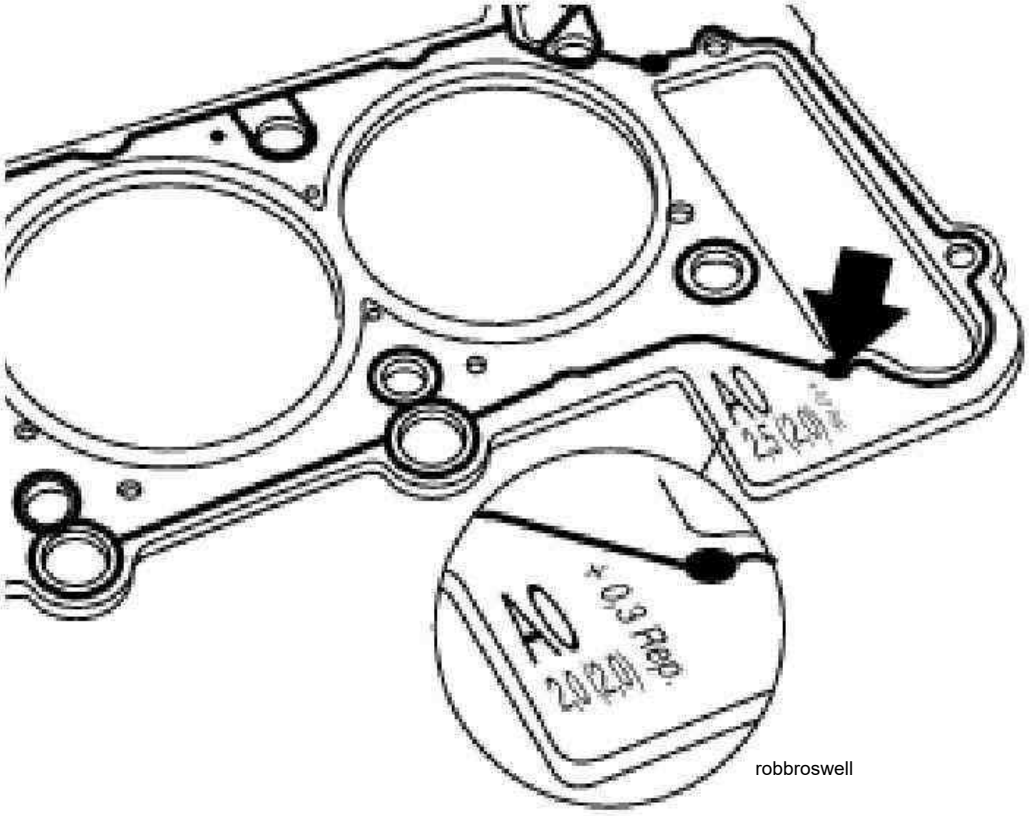


Fig. 35: Identifying Cylinder Head Seal
Courtesy of BMW OF NORTH AMERICA, INC.

11 12 729 CHECKING CYLINDER HEAD FOR WATERTIGHTNESS (M52TU / M54 / M56)

Special tools required:

- 11 7 390
- 11 7 391
- 11 7 392
- 11 7 393
- 11 7 394
- 11 7 395
- 11 7 396
- 11 7 397

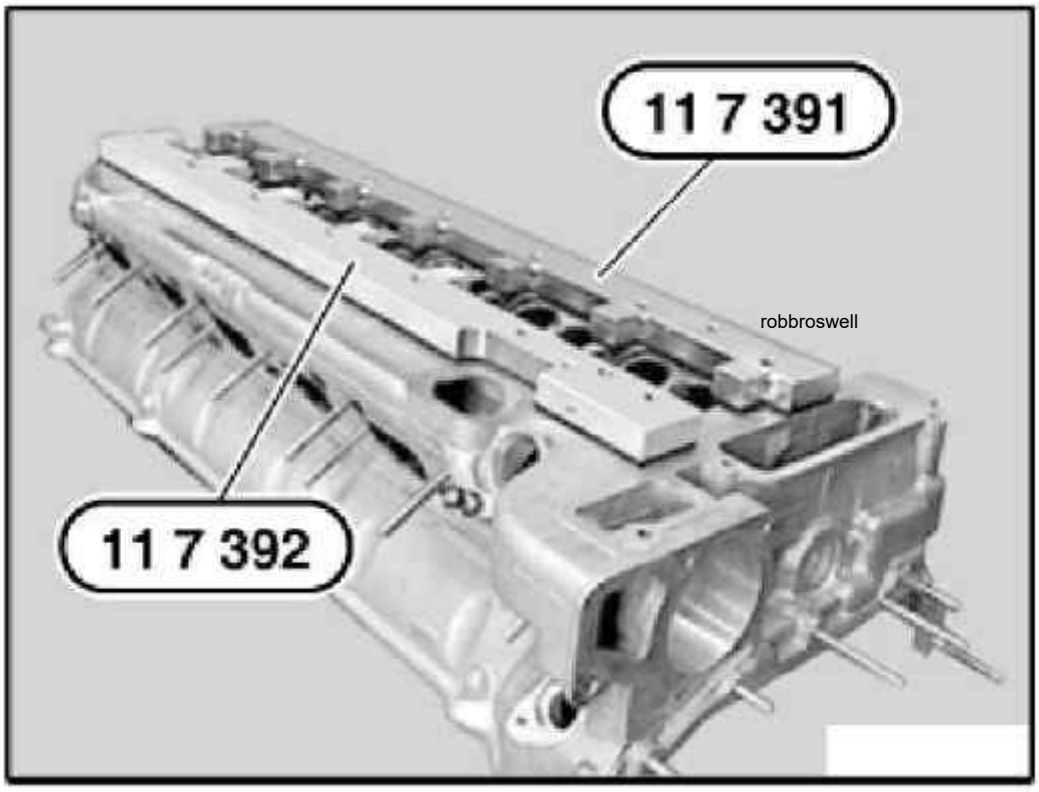
- 11 7 398

(cylinder head dismantled)

Prepare special tool kit 11 7 390.

NOTE: Special tool kit 11 7 390 consists of special tools 11 7 391 / 11 7 392 / 11 7 393 / 11 7 394 / 11 7 395 / 11 7 396 / 11 7 397 / 11 7 398.

Place special tools 11 7 391 / 11 7 392 on cylinder head sealing surface and screw down with cylinder head bolts.



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Fig. 36: Placing Special Tools On Cylinder Head Sealing Surface
Courtesy of BMW OF NORTH AMERICA, INC.

Turn back screw (1).

NOTE: special tool 11 7 394 is secured with a pin (2).

Fit special tool 11 7 394.

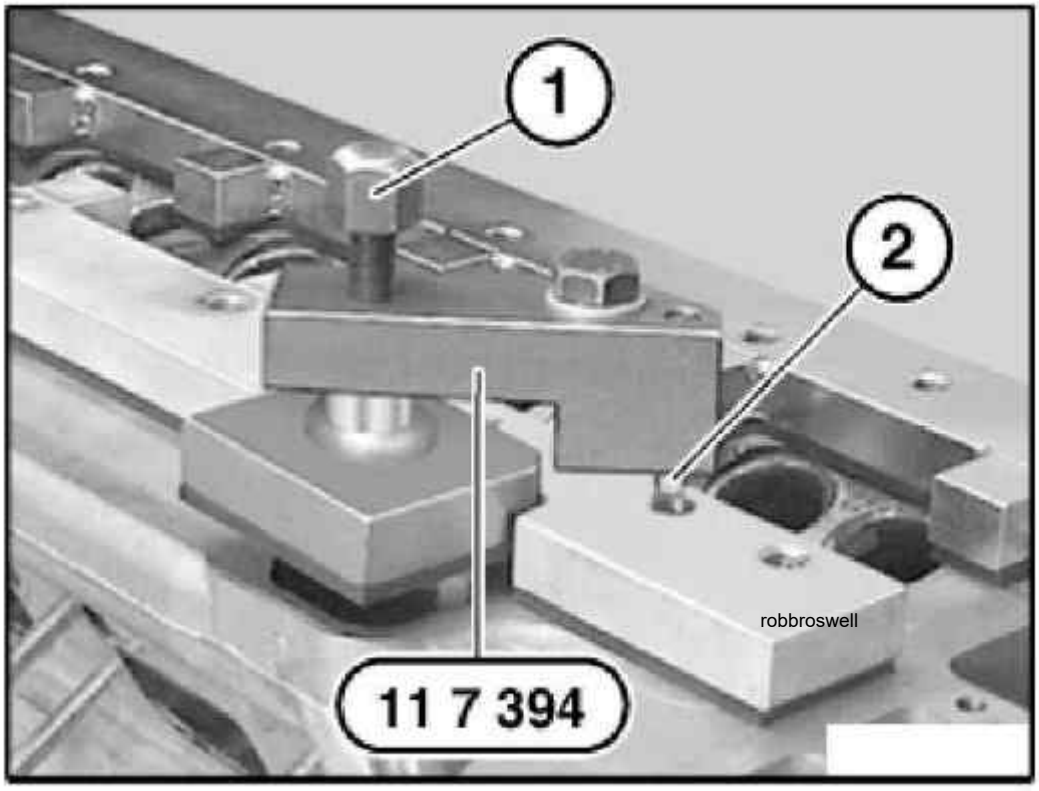


Fig. 37: Installing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw (1) by hand until special tool 11 7 393 rests on sealing surface.

Tighten down screw (1) by approx. a half to one turn.

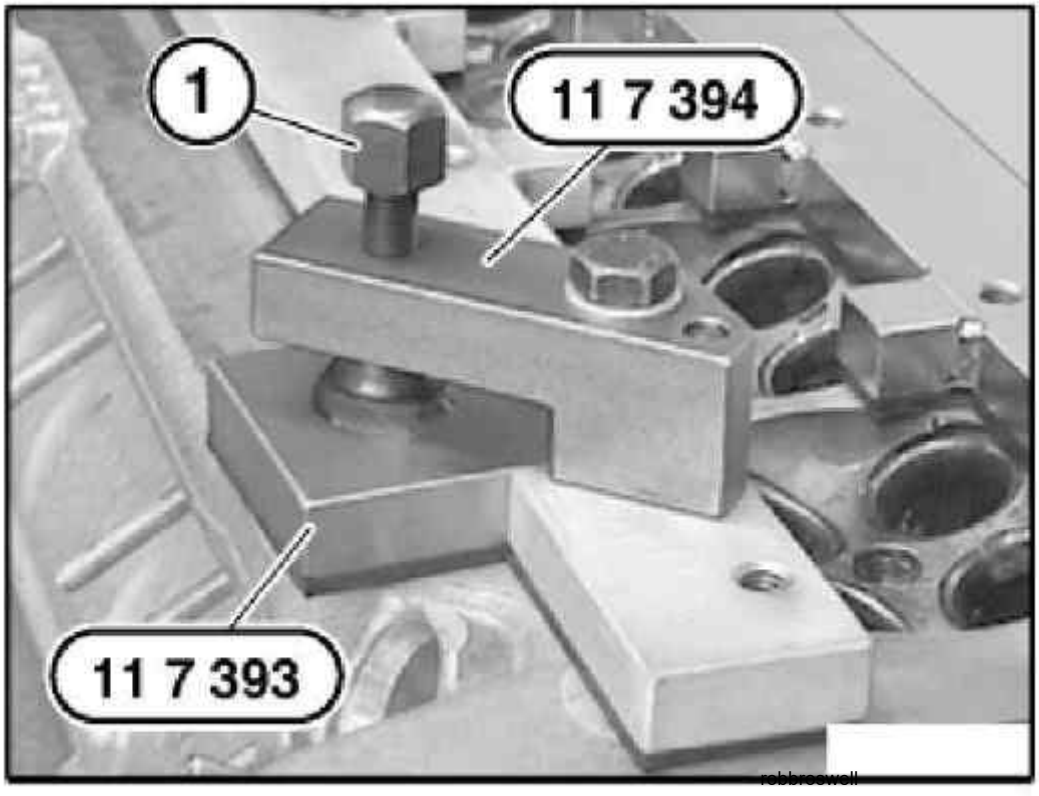


Fig. 38: Tightening Down Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Check sealing rings (1) and coat with water as anti-friction coating. Insert special tool 11 7 395 and tighten down.

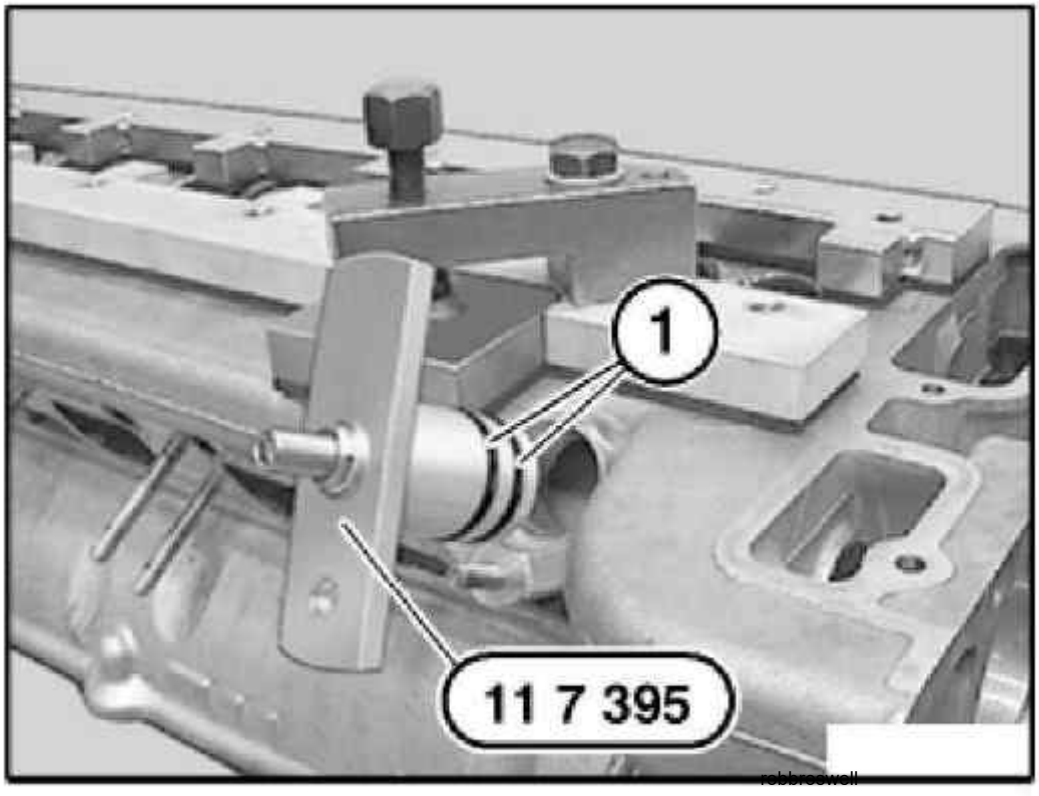


Fig. 39: Checking Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Seal coolant apertures with special tool kit 11 7 390.

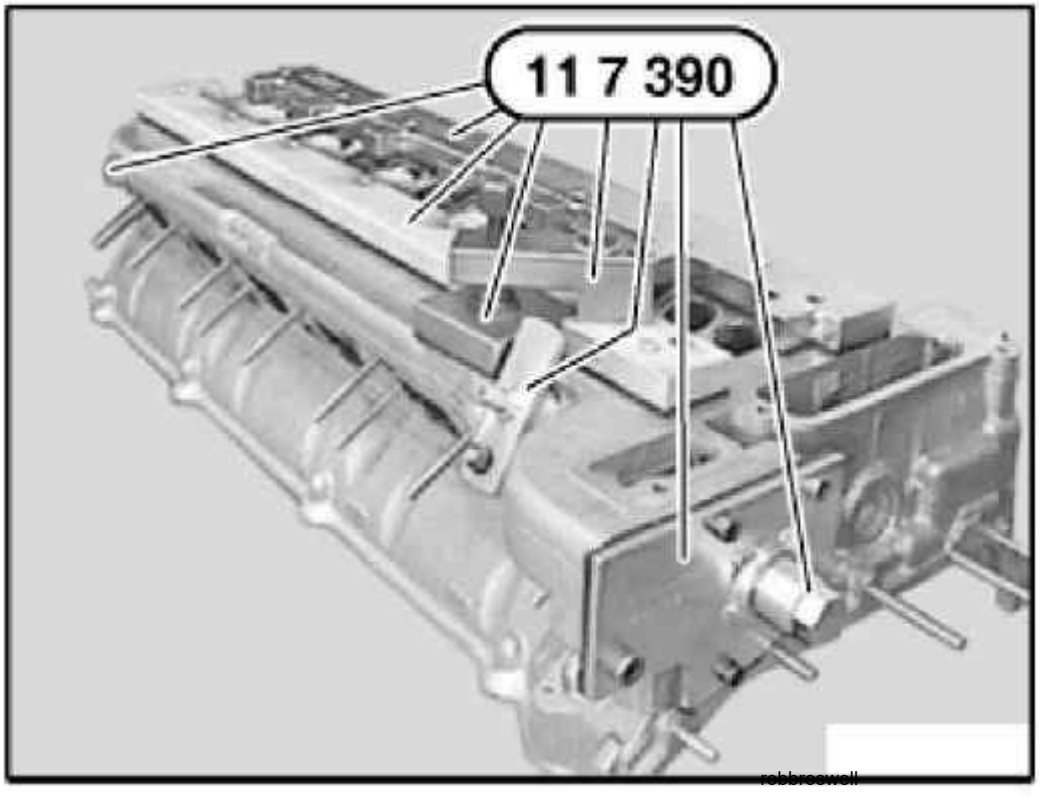


Fig. 40: Sealing Coolant Apertures With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air to special tool 11 7 395.

Immerse cylinder head in a water bath. Inspection pressure 4.5 bar.

Check cylinder head for escaping air (cracks).

NOTE: If necessary, soften the bath water with a cleaning agent.

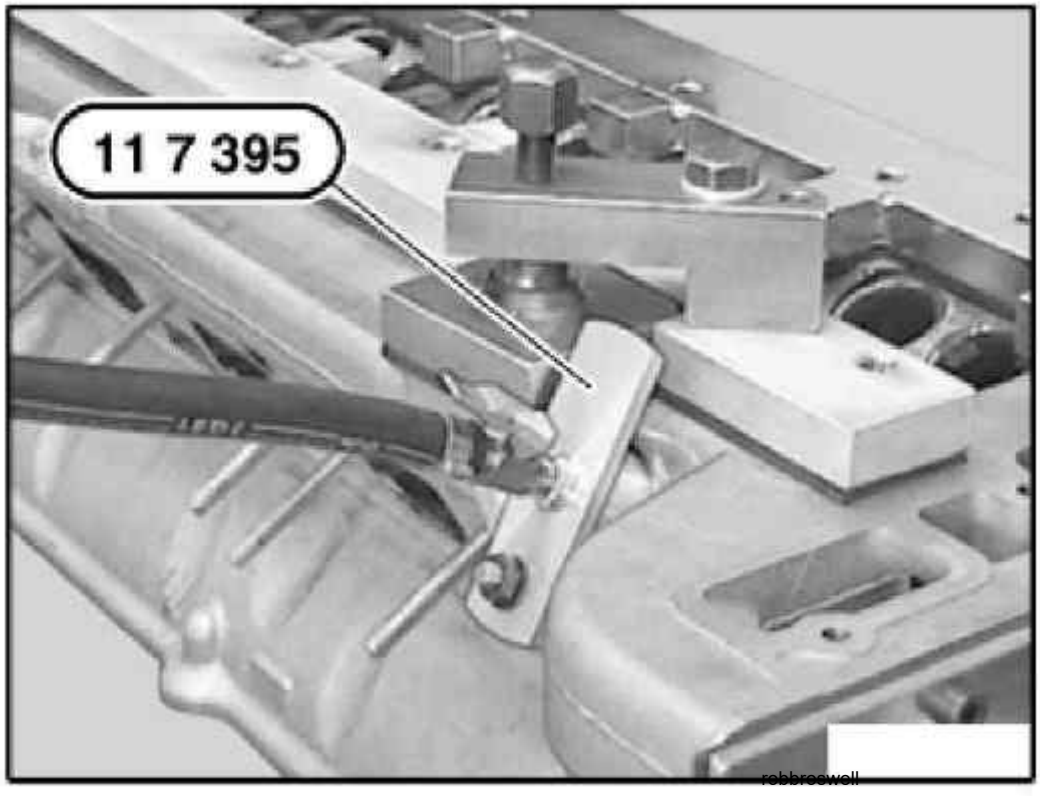


Fig. 41: Connecting Compressed Air To Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

OIL SUMP

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (M52TU / M54 / M56)

Special tools required:

- 00 0 200
- 00 0 201
- 00 0 202
- 00 0 204
- 00 0 208

NOTE: To remove the oil sump, you must lower the front axle support. There is no need to perform a front axle alignment check.

Assemble special tool 00 0 200 with special tools 00 0 201 / 00 0 202 / 00 0 204 / 00 0 208 and fit.

Secure special tool 00 0 200 to front suspension eye on engine.

NOTE: The supports (1) of special tool 00 0 208 must rest on the bolt connection of both side walls.

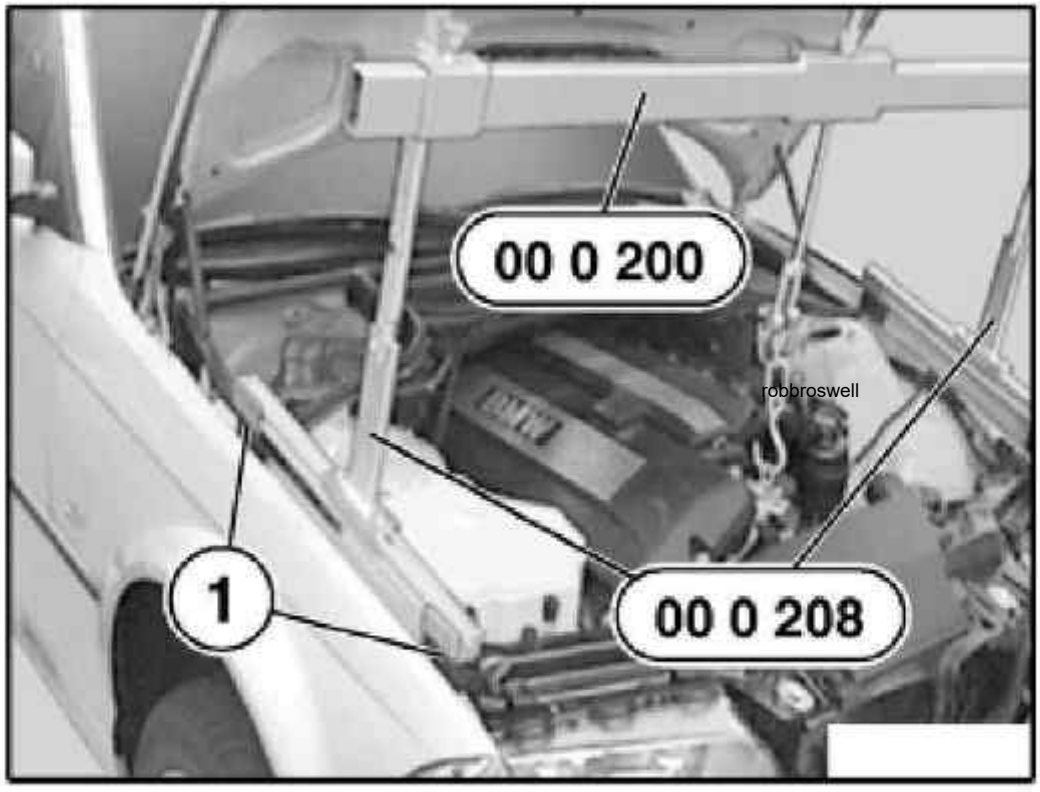


Fig. 42: Securing Special Tool To Front Suspension Eye On Engine
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten the screws (1 and 2).

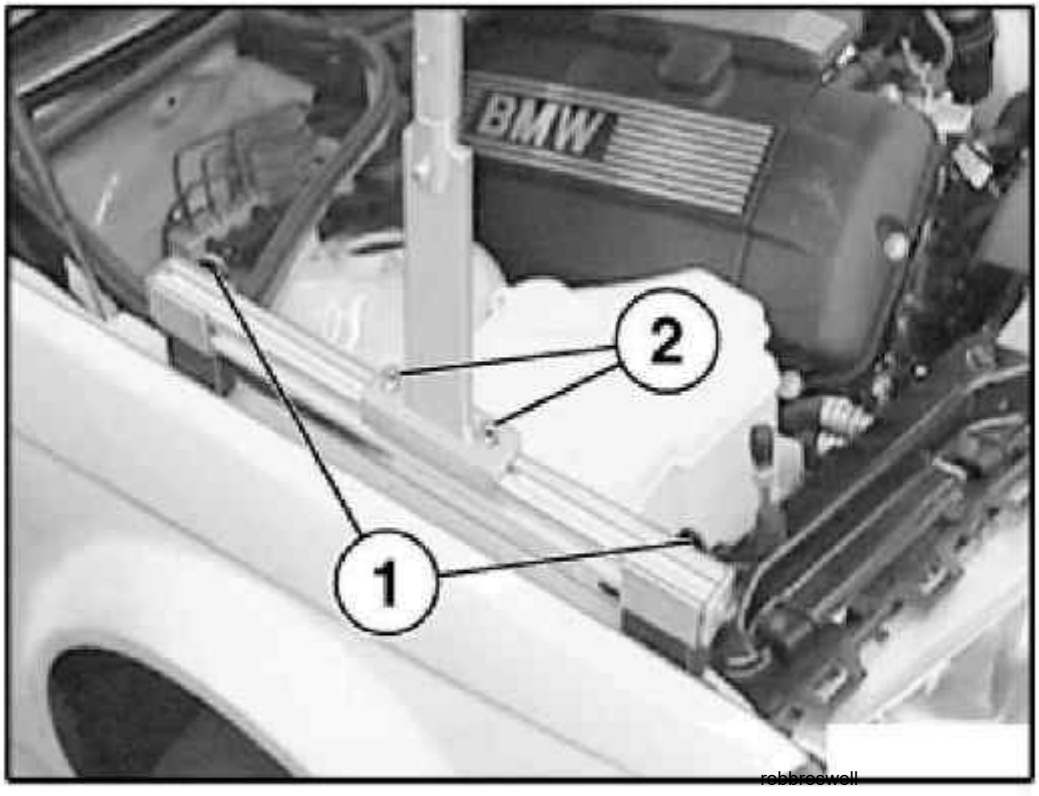


Fig. 43: Tightening Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Raise engine with special tool 00 0 200 approx. 5 mm.



Fig. 44: Removing Engine With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Remove suction filter housing .

Remove engine splash guard.

Drain engine oil .

On vehicles with automatic transmission:

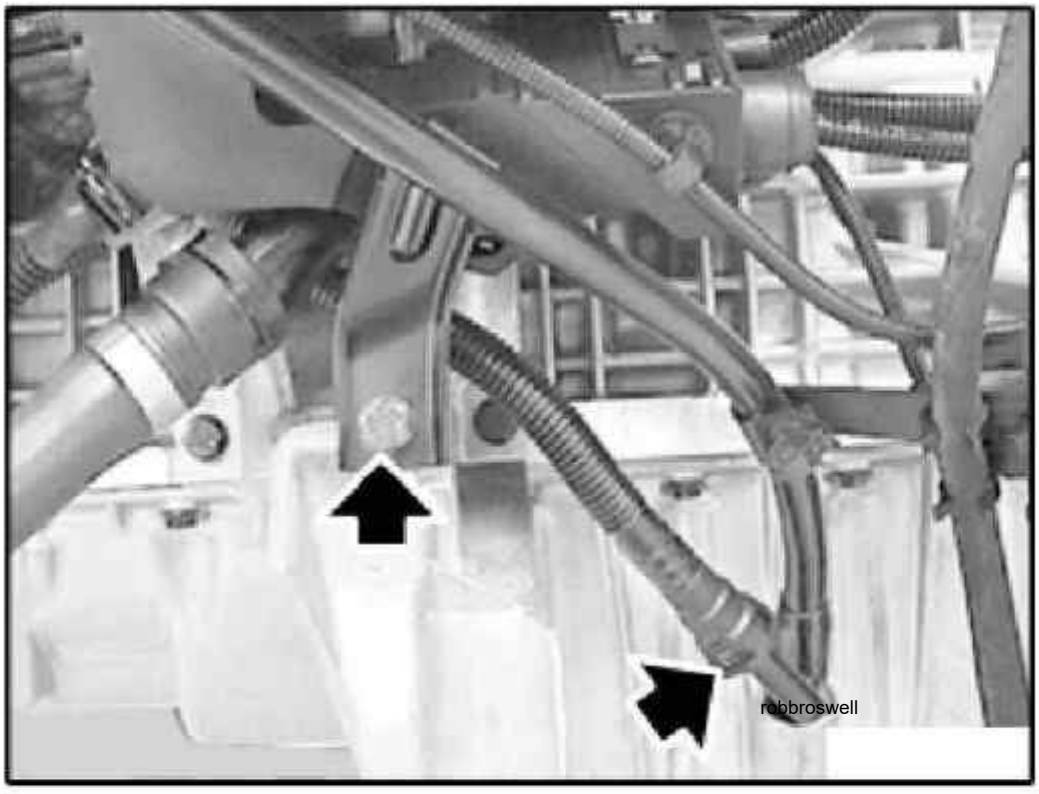
Disconnect oil lines from automatic transmission and from oil pan.

Release guide tube for dipstick.

NOTE: M52 TU and M54 only.

Detach return hose from cyclone oil separator on oil dipstick guide tube

Remove oil dipstick guide tube upwards.



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Fig. 45: Releasing Guide Tube For Dipstick
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring.



Fig. 46: Replacing O-Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Remove front end reinforcement.

Detach steering spindle from steering gear . See **STEERING GEAR** .

Remove vane pump for power steering unit (lines remain connected).

Disconnect plug connection to oil level sensor.

Loosen top and unfasten bottom of left and right engine mounts.

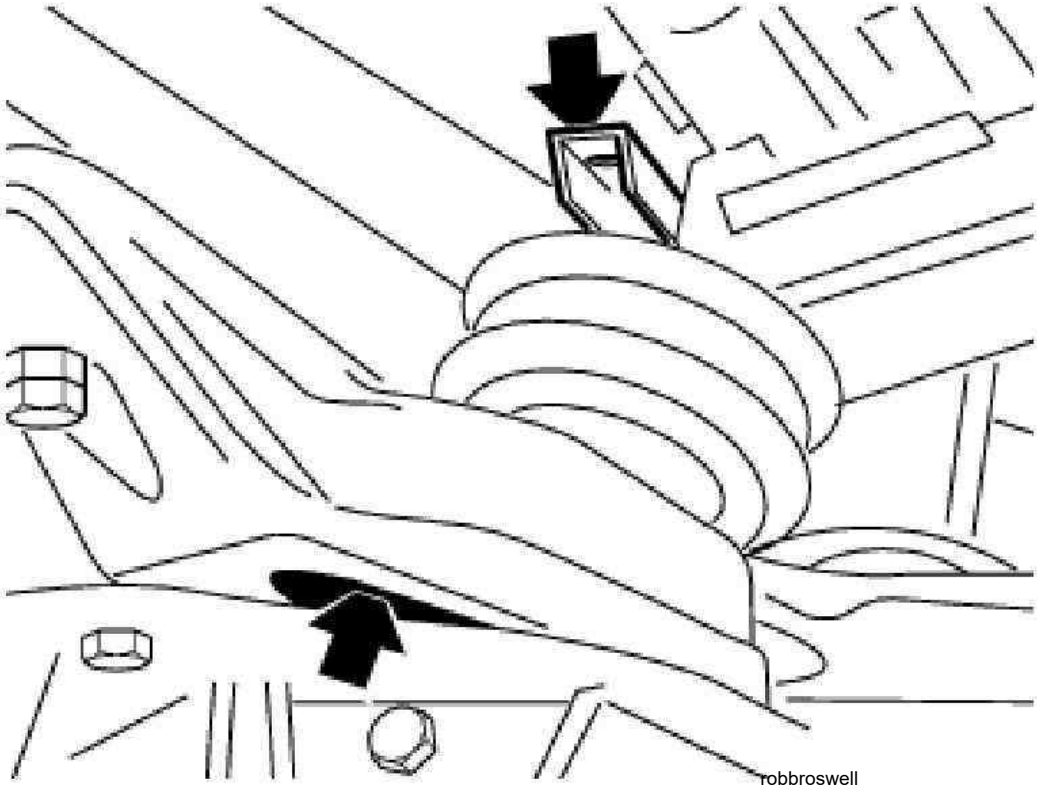


Fig. 47: Removing Right Engine Mounts Nut
Courtesy of BMW OF NORTH AMERICA, INC.

11 13 000 REMOVING AND INSTALLING, SEALING OR REPLACING OIL SUMP (M54)

Necessary preliminary tasks:

- Remove intake filter housing .
- Remove guide tube for oil dipstick . See **Fig. 45**.
- Lowering front axle support .
- Drain off engine oil .
- Disconnect plug connection to oil level sensor.

On vehicles with automatic transmission:

Detach oil lines from automatic transmission and from oil pan.

Unfasten oil pan screws at transmission and engine ends.

Lower and remove oil pan.

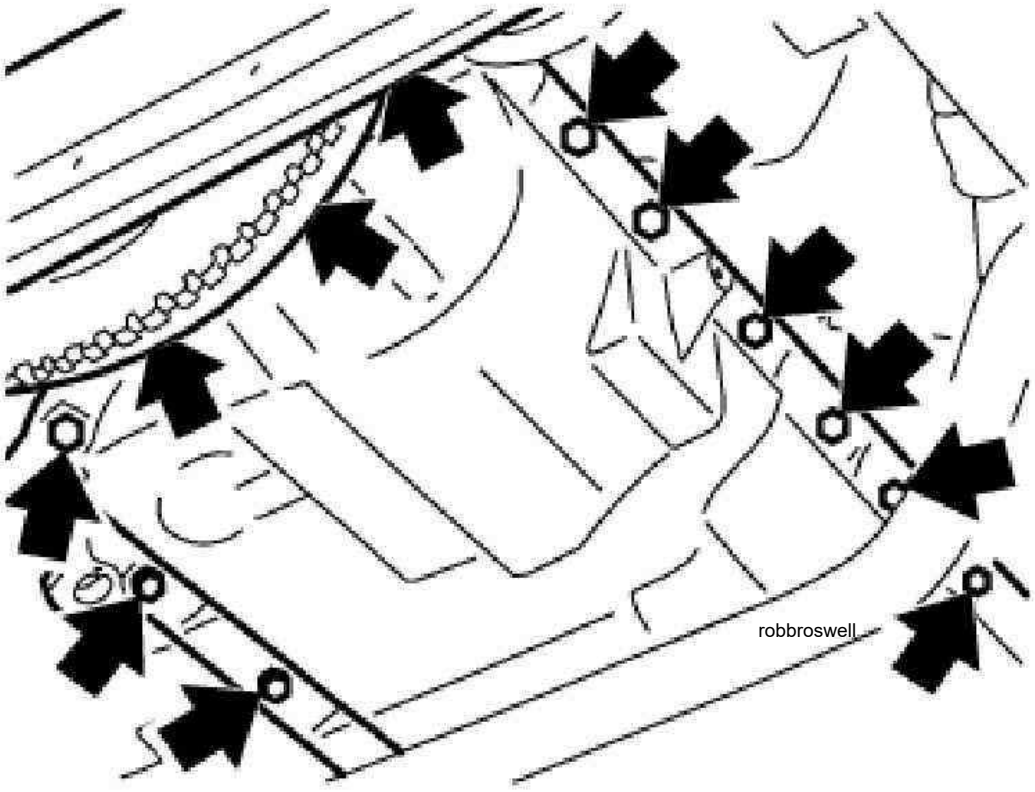


Fig. 48: Removing Oil Pan Screws At Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Sealing faces clean and free of seal debris.

Apply approx. 3 mm wide, 2 mm high coat of Drei Bond to the area around seams.

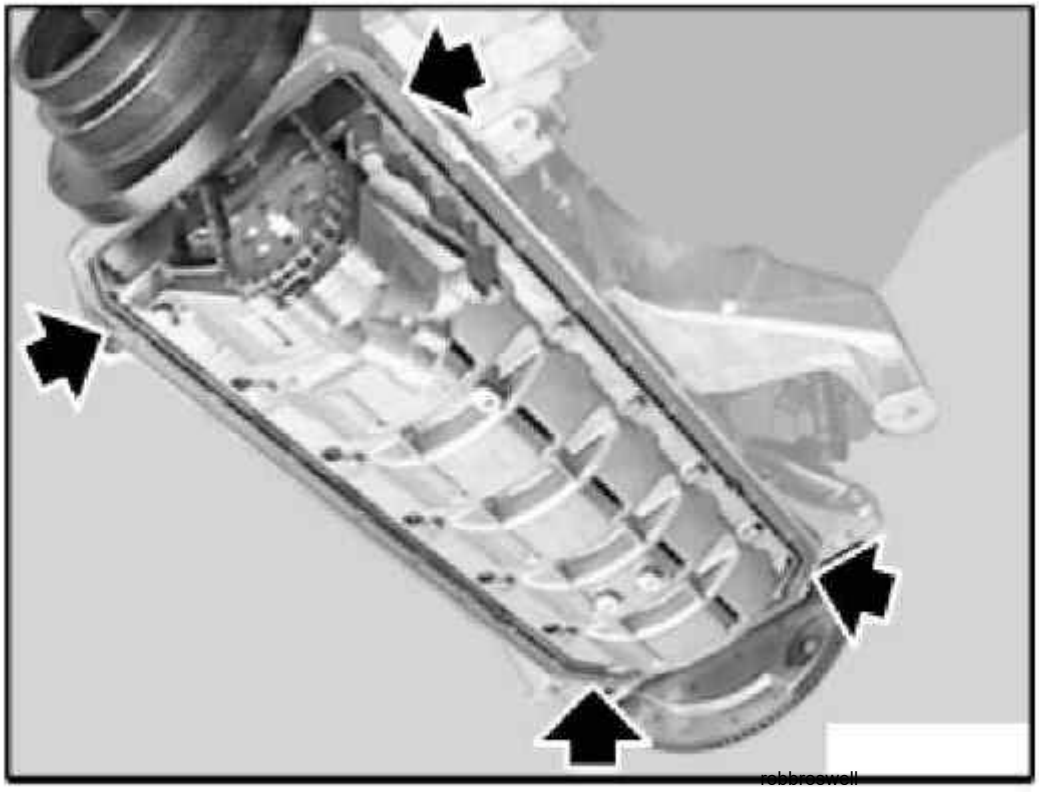


Fig. 49: Applying High Coat Of Drei Bond
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Replace seal.
2. Install oil sump.
3. Insert all screws on transmission end,
4. without preload at this stage.
5. Tighten down screws on engine end.
6. Tighten screws on transmission end.

HOUSING COVER

11 14 110 REMOVING AND INSTALLING LOWER TIMING CASE COVER (M52 / S52 / M52TU / M54)

Remove VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

Remove coolant thermostat . See **Coolant Thermostat**.

Remove alternator drive belt and drive belt tensioner.

Brace pulley for water pump with drive belt and unfasten screws.

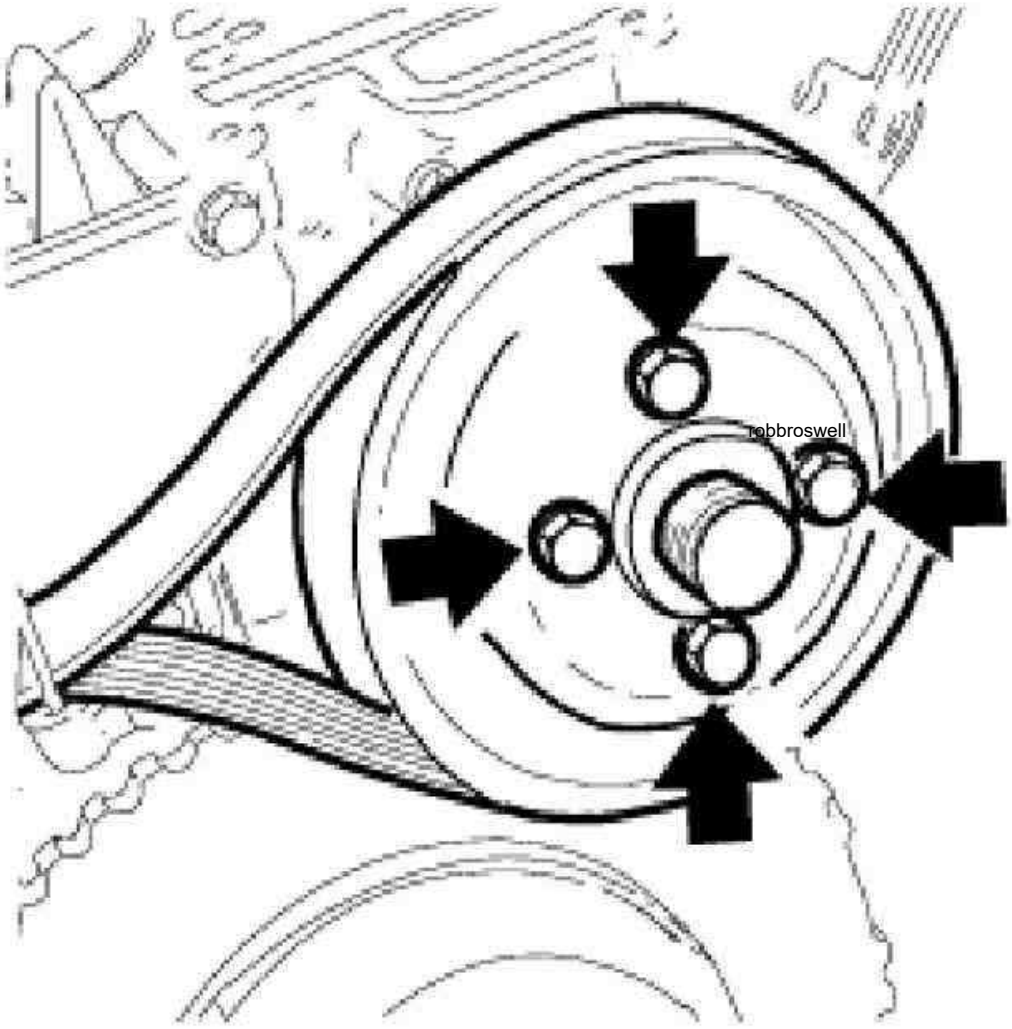


Fig. 50: Removing Water Pump Pulley Bolts

Courtesy of BMW OF NORTH AMERICA, INC.

M52 / S52 only

Unfasten engine speed sensor.

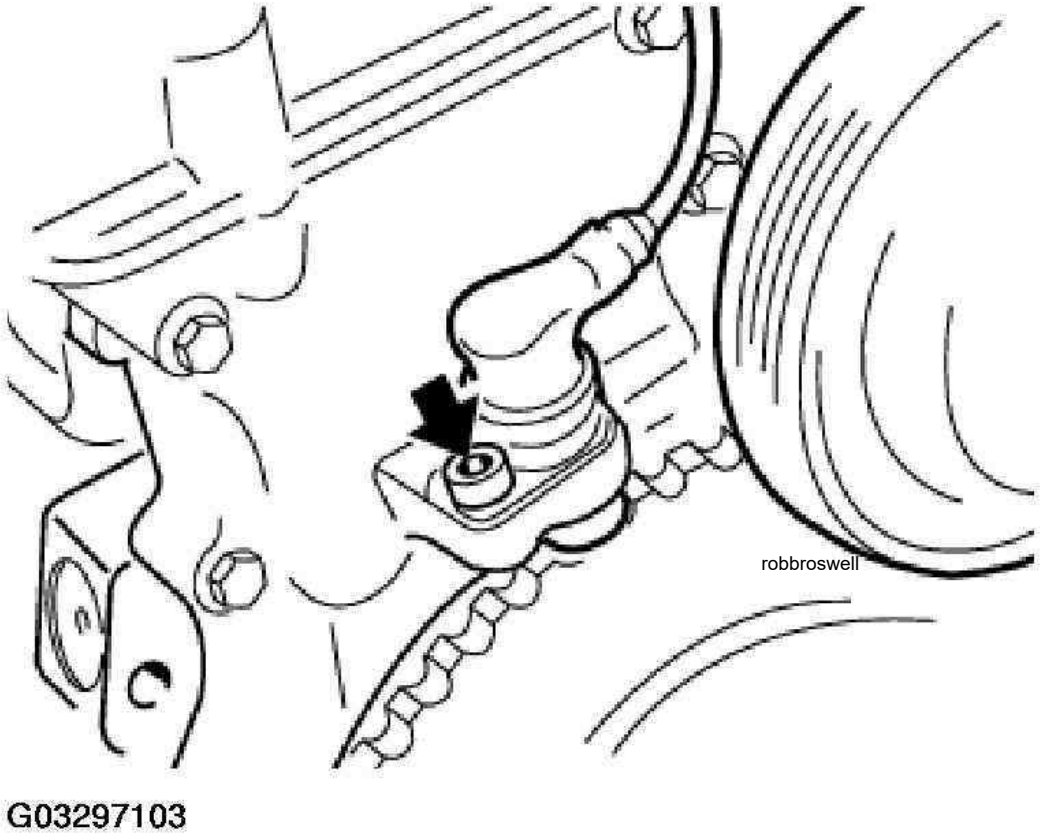


Fig. 51: Removing Engine Speed Sensor Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Remove vibration damper . See **11 23 010 Removing And Installing Or Replacing Vibration Damper (M52TU / M54 / M56)**.

Version where vibration damper and hub are two parts: Remove hub for vibration damper . See **11 23 010 Removing And Installing Or Replacing Vibration Damper (M52TU / M54 / M56)**

Remove oil sump . See **11 13 000 Removing And Installing, Sealing Or Replacing Oil Sump (M52TU / M54 / M56)**.

Drive out dowel pins from timing case cover towards rear.

(Mandrel diameter less than 5 mm)

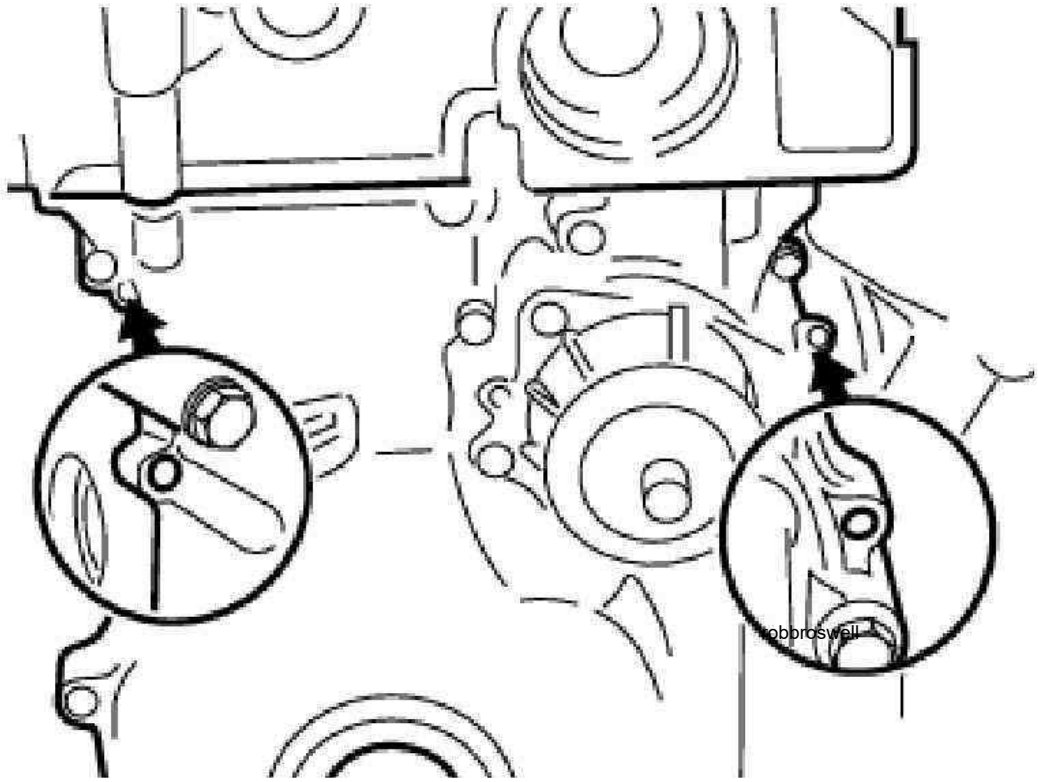


Fig. 52: Removing Dowel Pins From Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew timing case cover to cylinder head bolts.

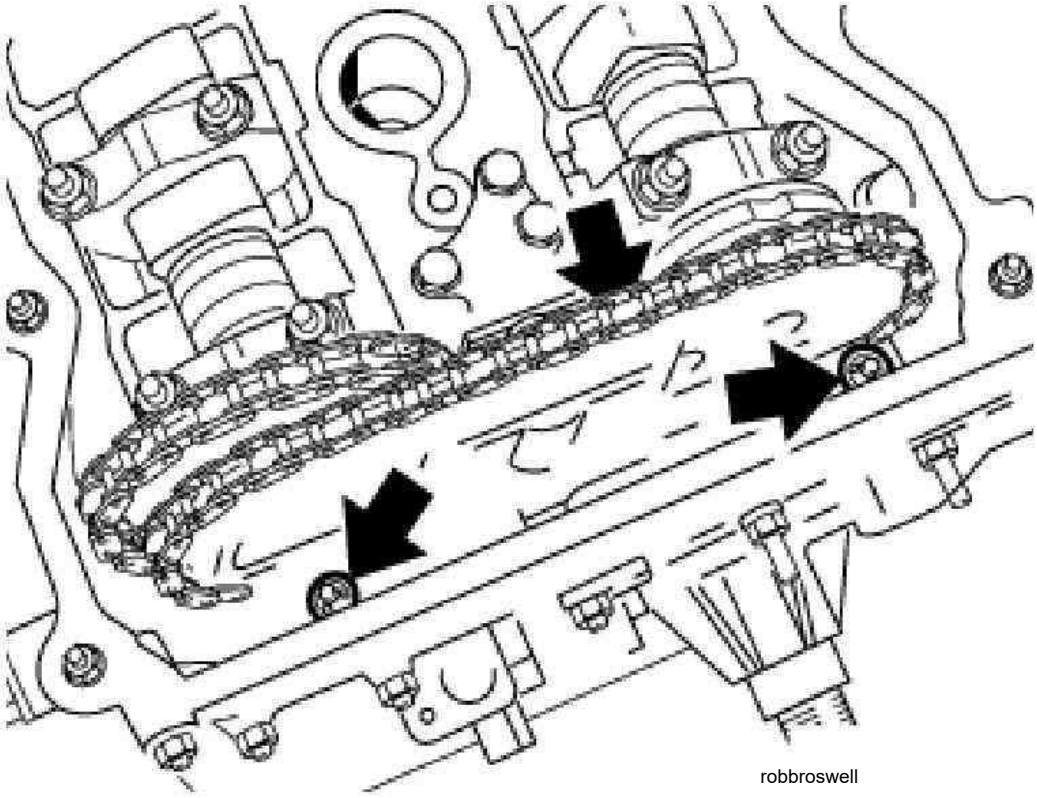


Fig. 53: Removing Timing Case Cover To Cylinder Head Bolts
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove timing case cover.

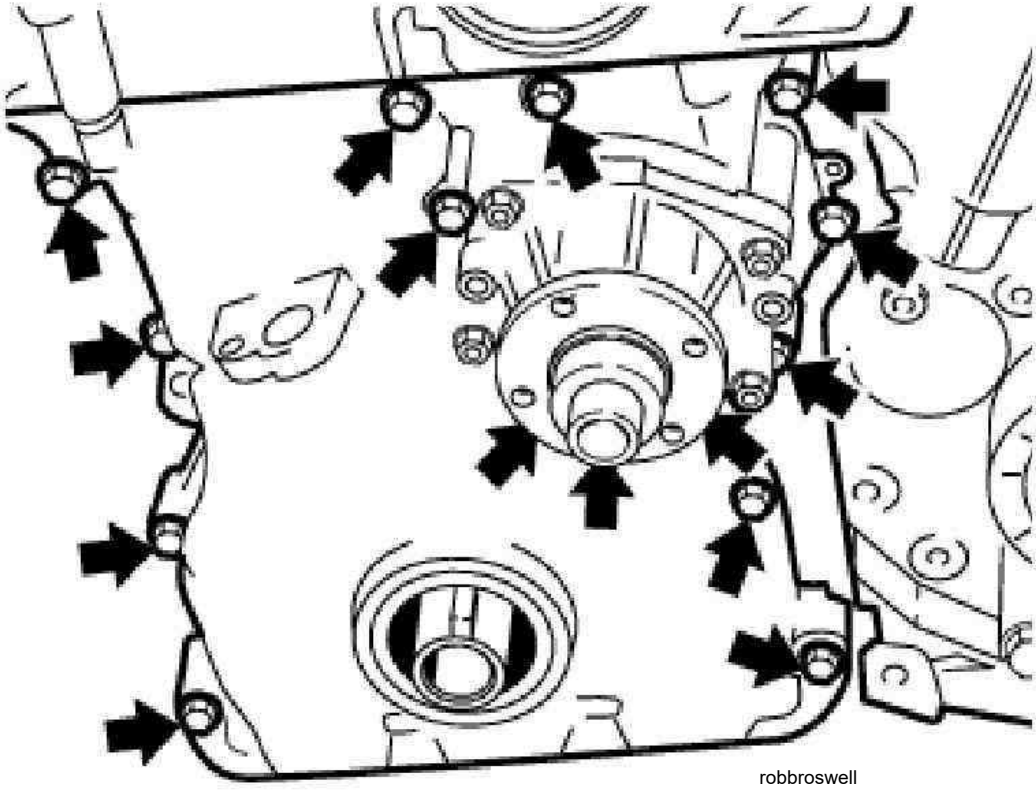


Fig. 54: Removing Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Check cylinder head gasket for damage; if necessary, remove cylinder head and replace cylinder head gasket.

Installation:

Clean sealing surfaces.

Drive alignment pins into timing case cover until they protrude approx. 2 to 3 mm.

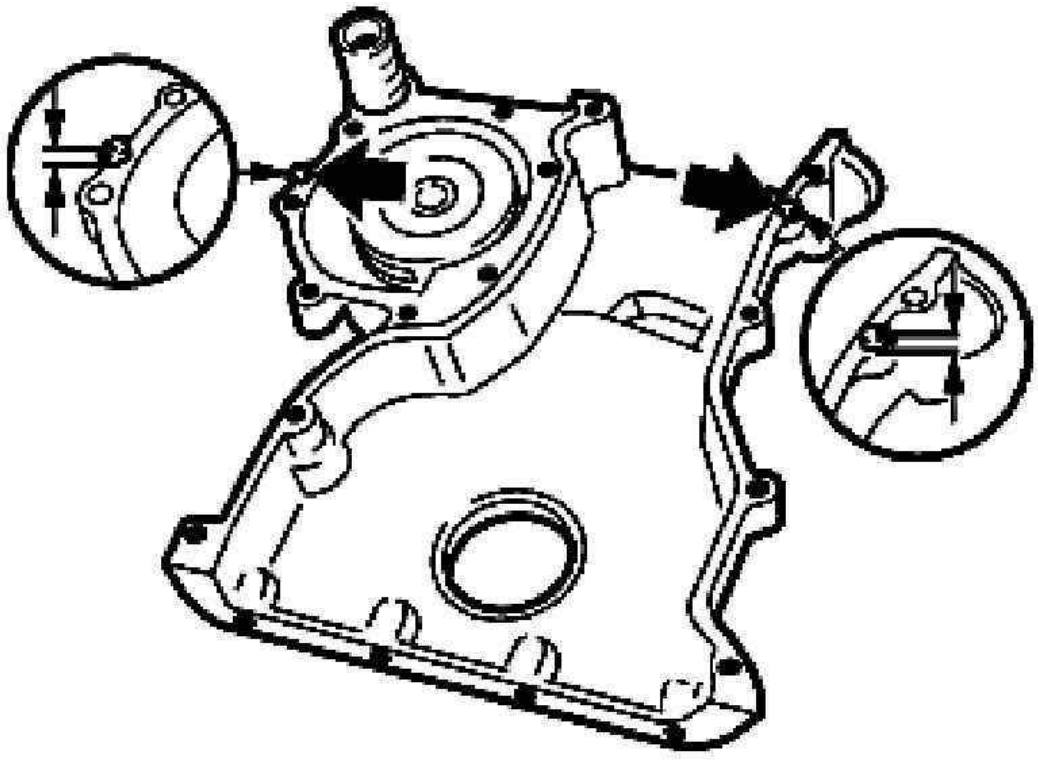


Fig. 55: Aligning Pins Into Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Secure new seals to timing case cover with a little grease.

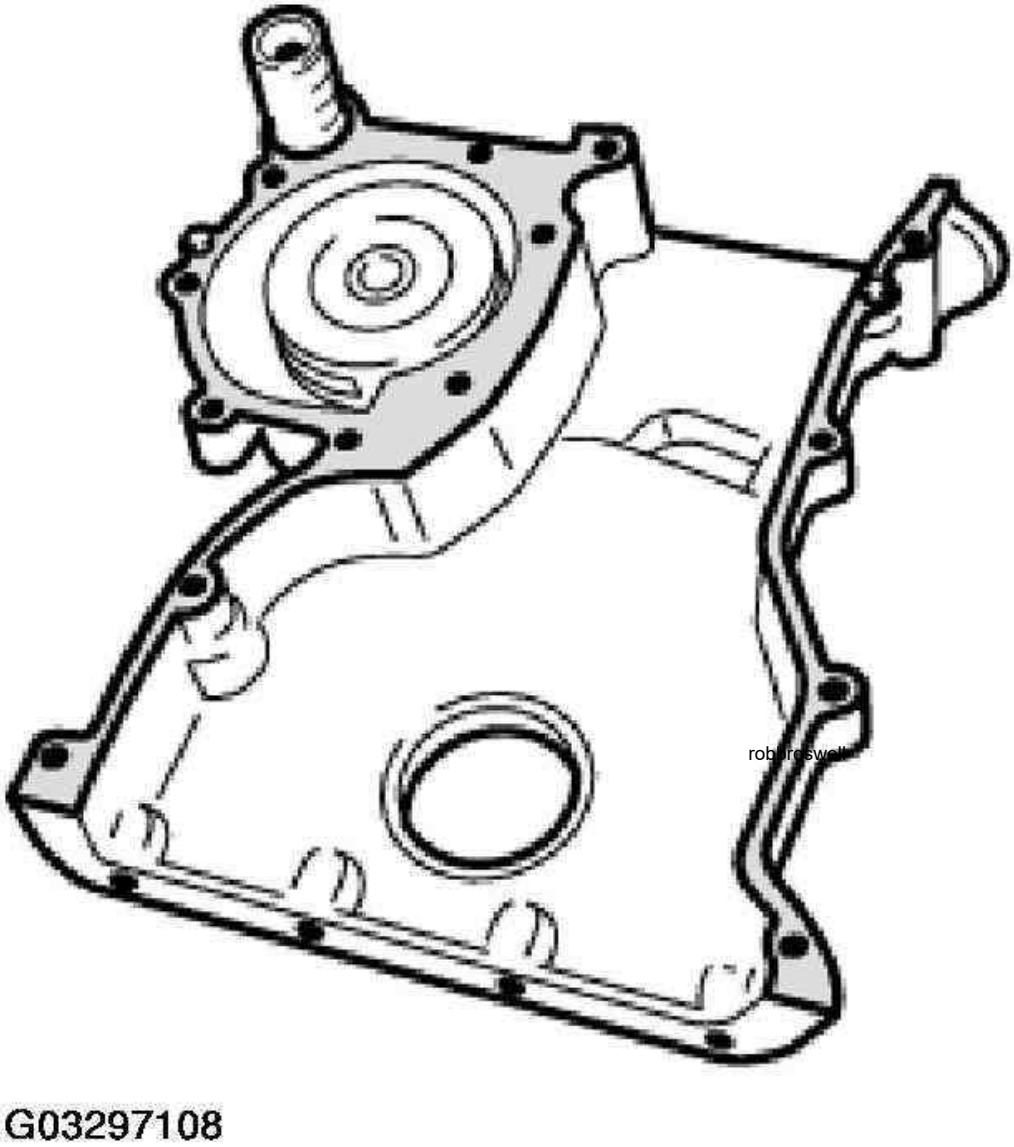


Fig. 56: Securing New Seals To Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Sealing faces clean and free of seal debris.

Apply Drei Bond 1209 sealing compound at following points:

- A bead at the transitions to the cylinder head gasket on the left and right.
- Thinly and evenly to the entire sealing face of the timing case cover to the cylinder head gasket.

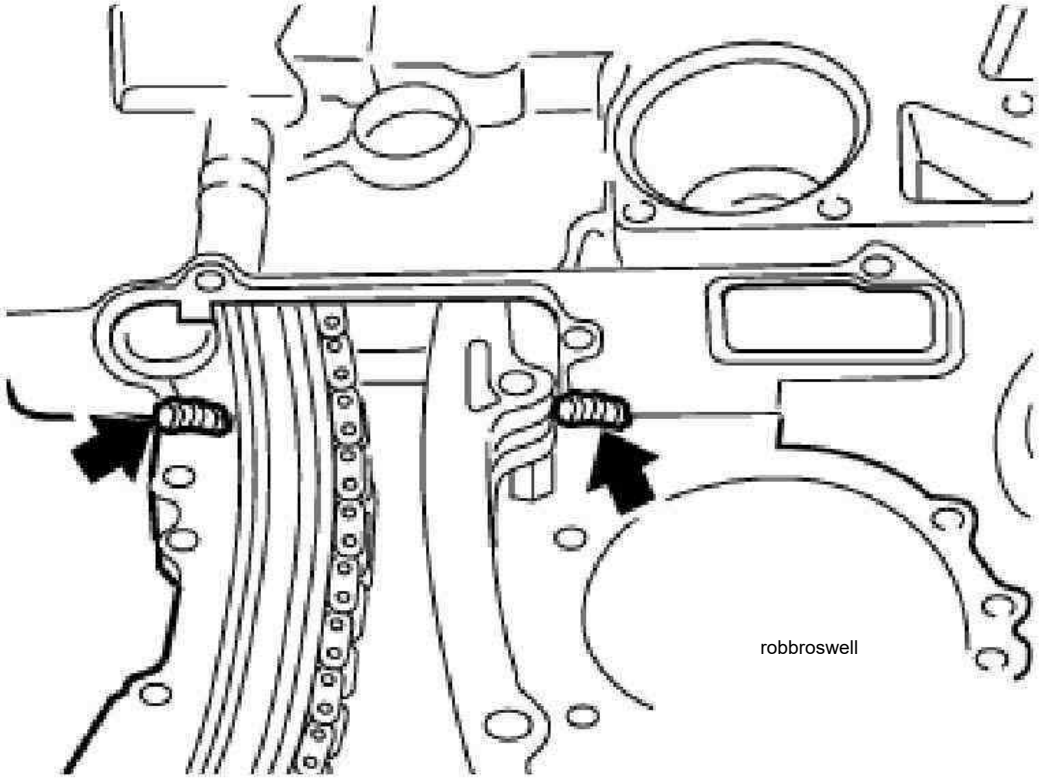


Fig. 57: Applying Bead At Transitions To Cylinder Head Gasket On Left And Right
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install timing case cover, insert all screws and initially tighten to approx. 5 Nm.

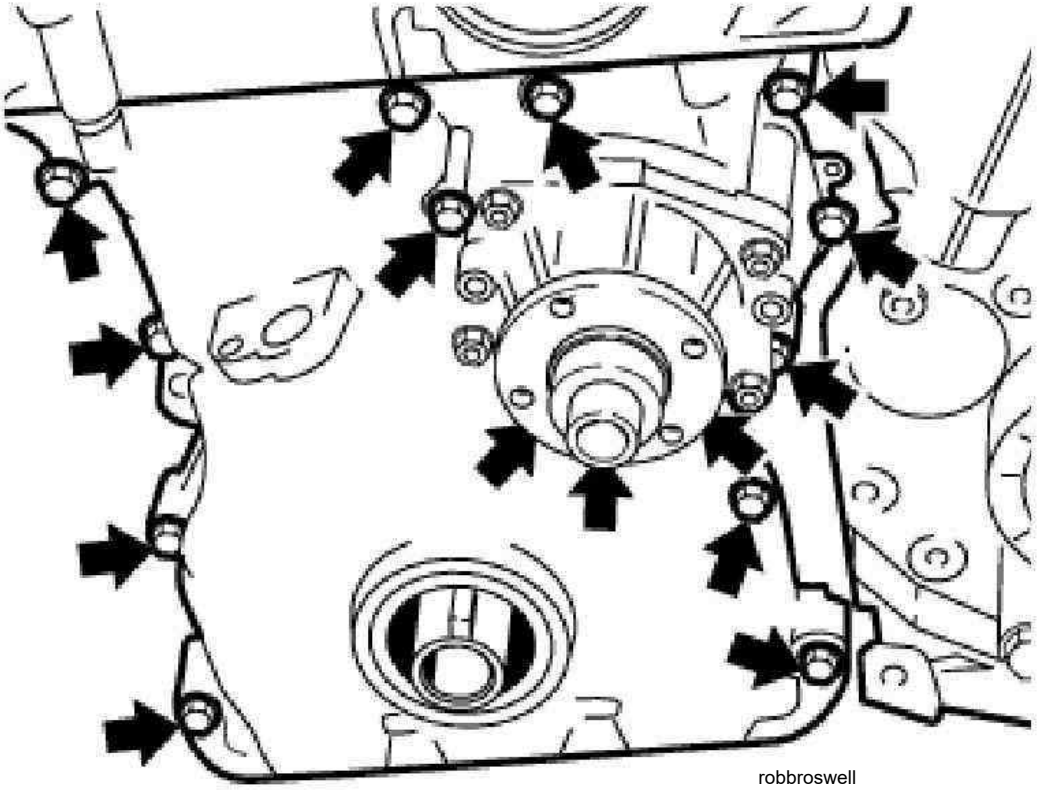


Fig. 58: Installing Timing Case Cover
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Drive in dowel pins from front until flush.

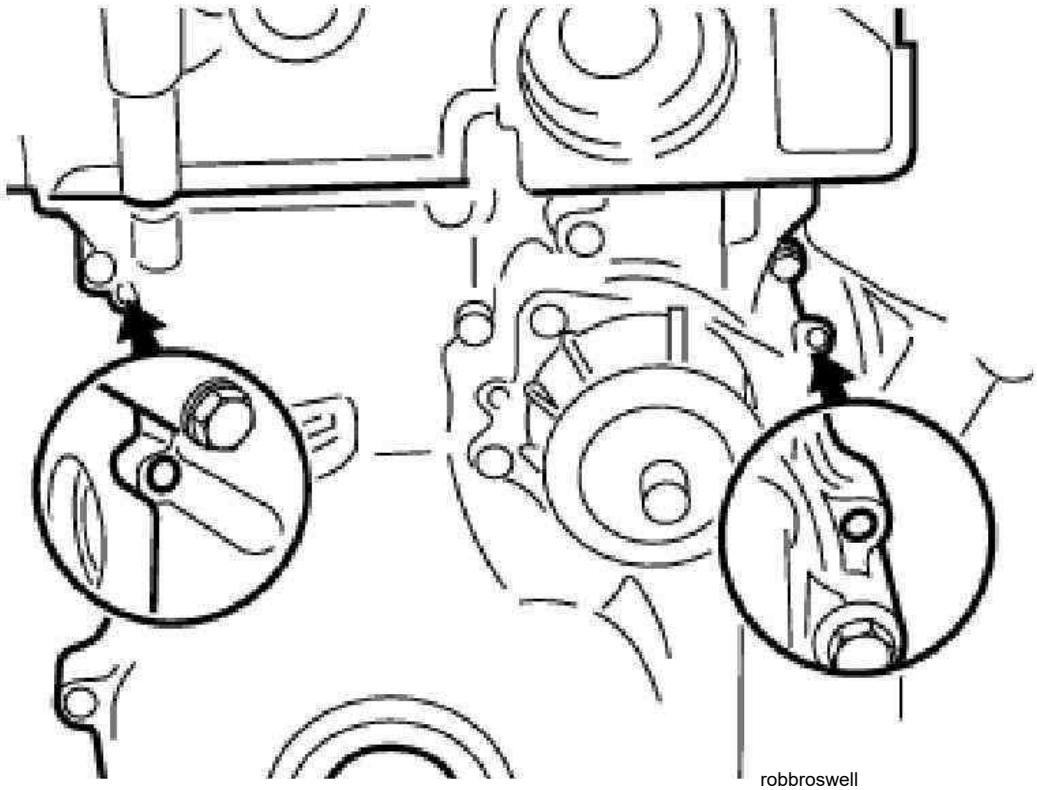


Fig. 59: Installing Dowel Pins From Front Until Flush
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Fully tighten all screws in alternate sequence.

Tightening torque, see 11 14 1AZ in **ENGINE - TIGHTENING TORQUES** .

IMPORTANT: Once all screws have been tightened down, retighten them in a second operation.

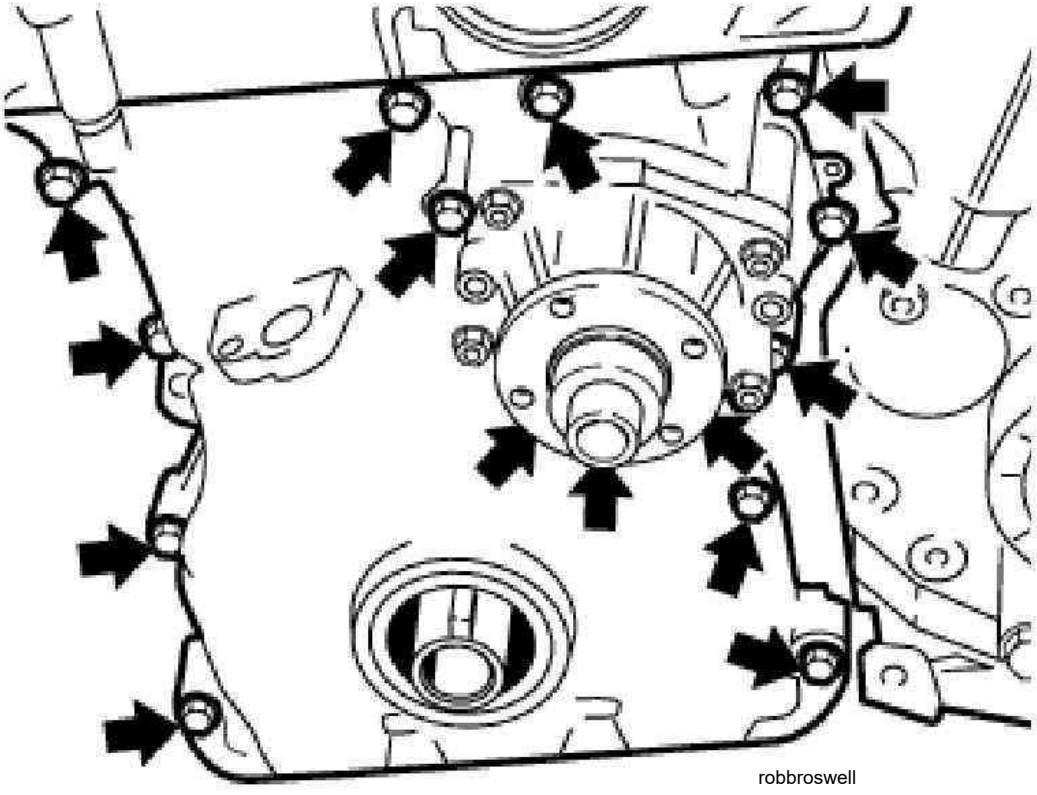


Fig. 60: Tightening Timing Case Cover Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws, tighten screw connection for timing case cover to cylinder head.

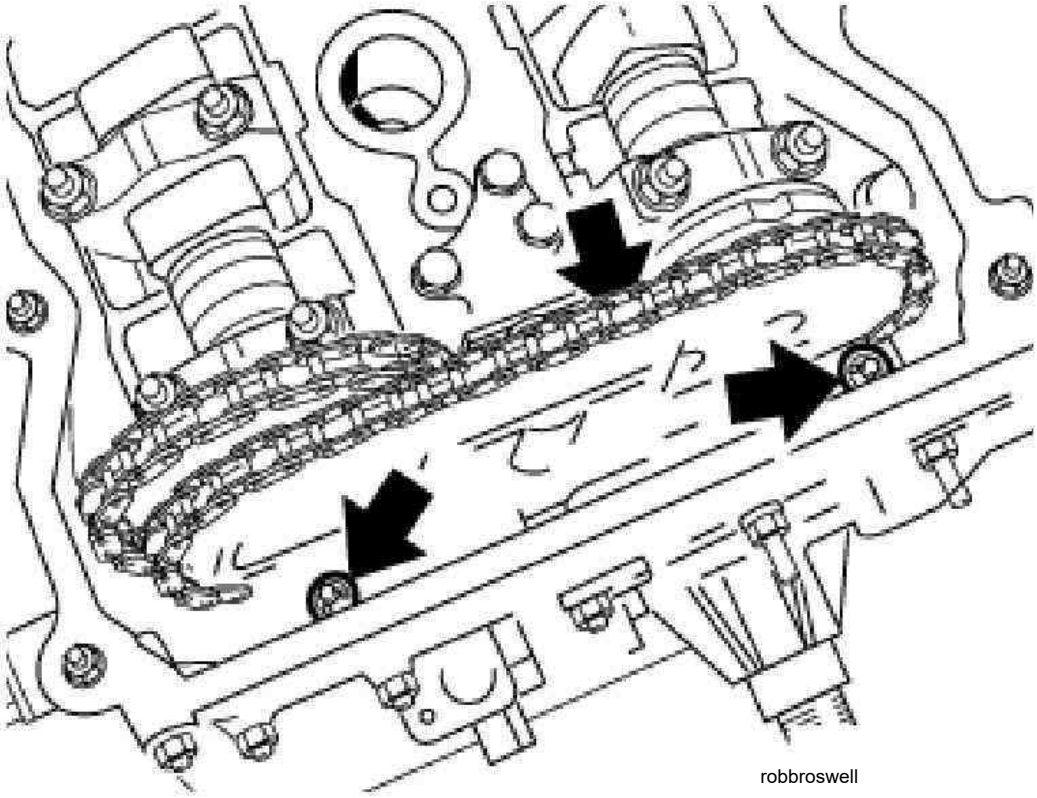


Fig. 61: Tightening Screw Connection For Timing Case Cover To Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Replace radial seal in lower timing case cover . See **11 14 141 Replacing Radial Seal In Lower Timing Case Cover**.

Assemble engine.

11 14 141 REPLACING RADIAL SEAL IN LOWER TIMING CASE COVER

Special tools required:

- 11 2 380
- 11 2 383
- 11 2 385
- 11 3 280

NOTE: This repair instruction is valid for the following engines:

- **M50 / M52 / M52TU / M54 / M56**
- **S52**

Remove vibration damper . See **11 23 010 Removing And Installing Or Replacing Vibration Damper (M52TU / M54 / M56)**.

NOTE: Version where vibration damper and hub are two parts:

Remove hub for vibration damper . See **11 23 010 Removing And Installing Or Replacing Vibration Damper (M52TU / M54 / M56)**.

Fit special tool 11 2 383 to crankshaft.

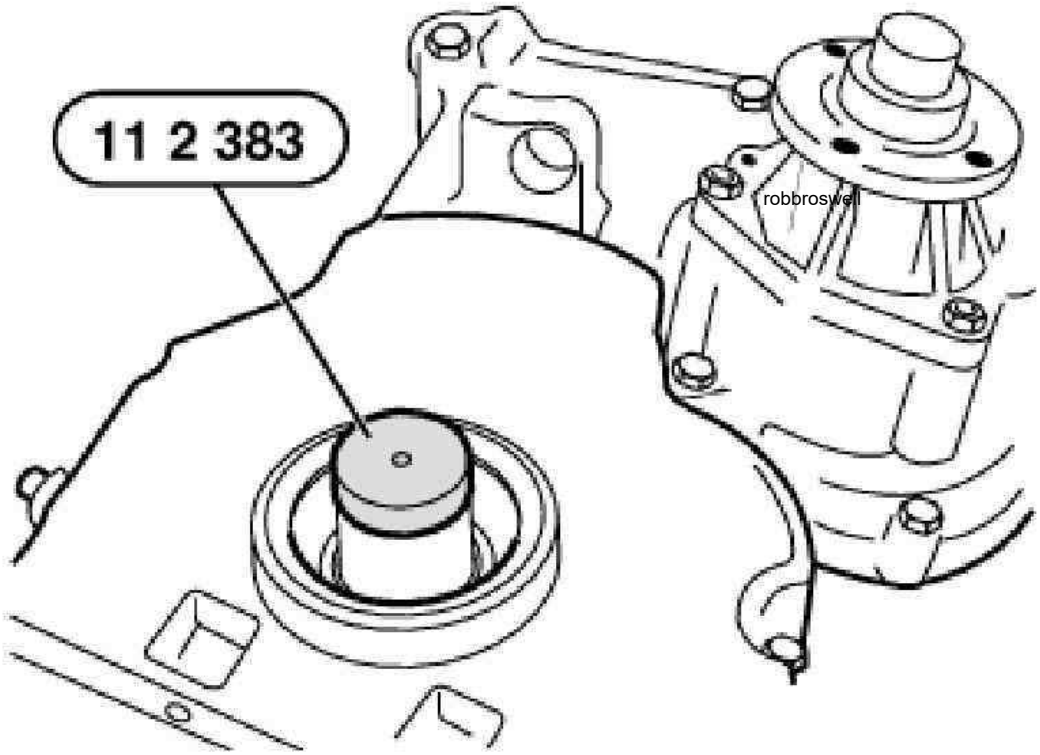


Fig. 62: Fitting Special Tool To Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 2 385 to crankshaft.

Align groove of special tool 11 2 385 to featherkey of crankshaft.

NOTE: Special tool 11 2 385 centers special tool 11 2 380.

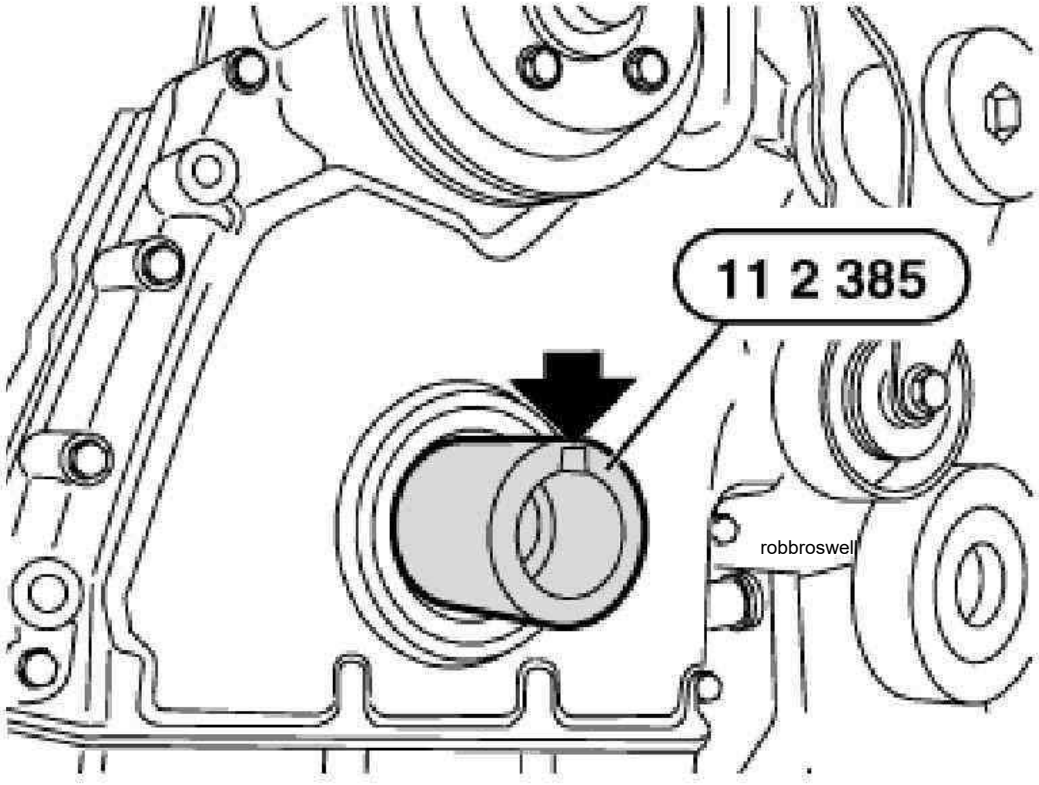
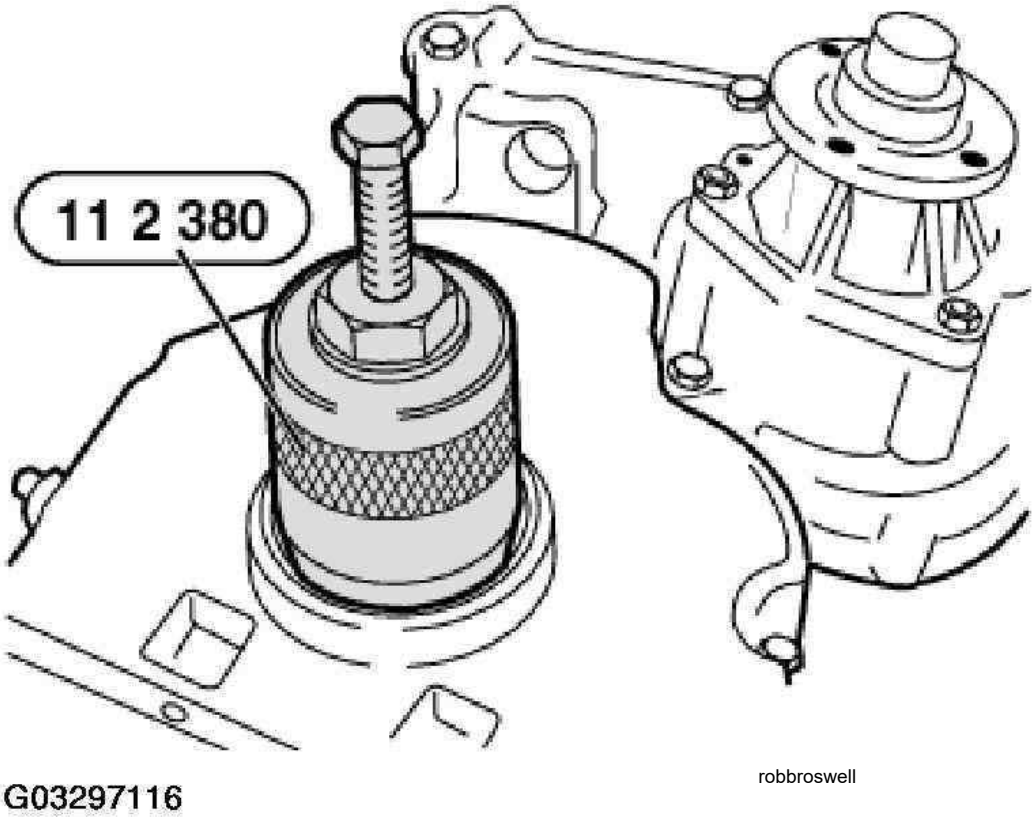


Fig. 63: Aligning Groove Of Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Screw in special tool 11 2 380 until it has made firm contact with radial seal.

Remove radial seal by tightening screw on special tool.



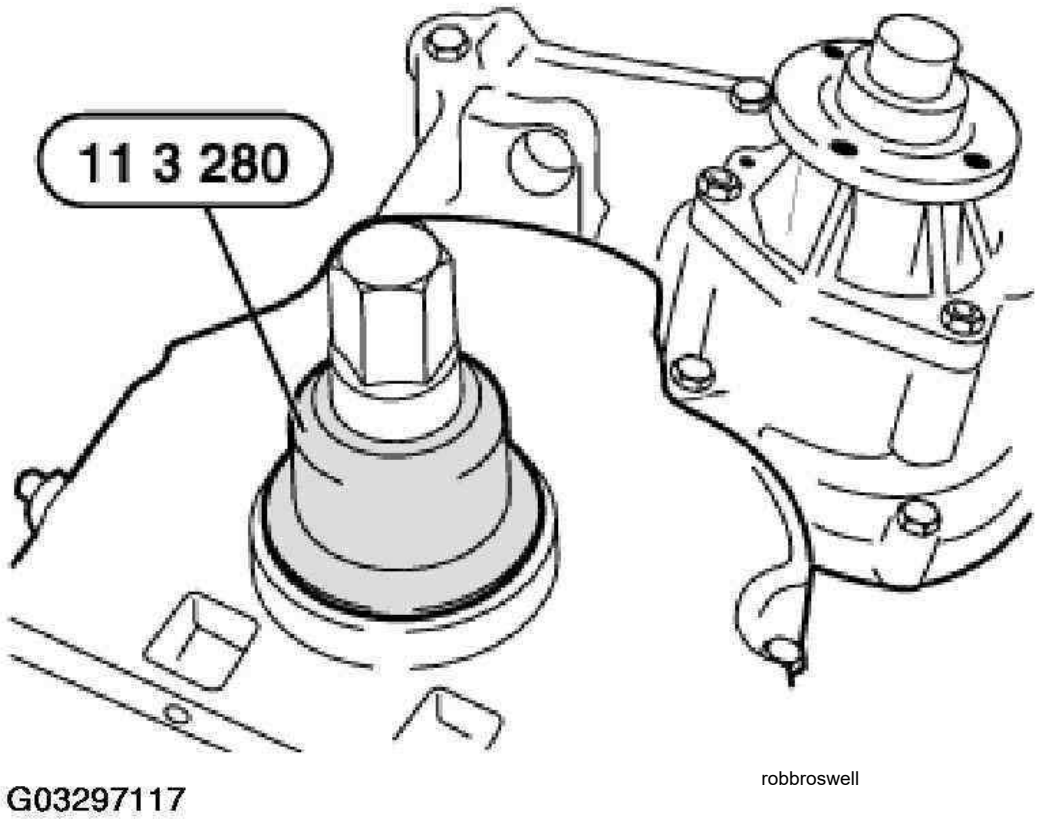
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Fig. 64: Removing Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Coat sealing lips of new radial sealing ring with oil.

Using special tool 11 3 280 and centering screw, install new radial seal flush with timing case cover.



robbroswell

Fig. 65: Installing Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

11 14 151 REPLACING CRANKSHAFT RADIAL SEAL (TRANSMISSION SIDE)

NOTE: This repair instruction is valid for the following engines:

- **M40 / M42 / M43 / M43TU / M44**
- **M50 / M52 / M52TU / M54 / M56**
- **S52 / S54**

Necessary preliminary tasks:

- Remove gearbox
- Drain off engine oil
- Remove flywheel

Unfasten oil sump screws on transmission end.

Loosen oil pan.

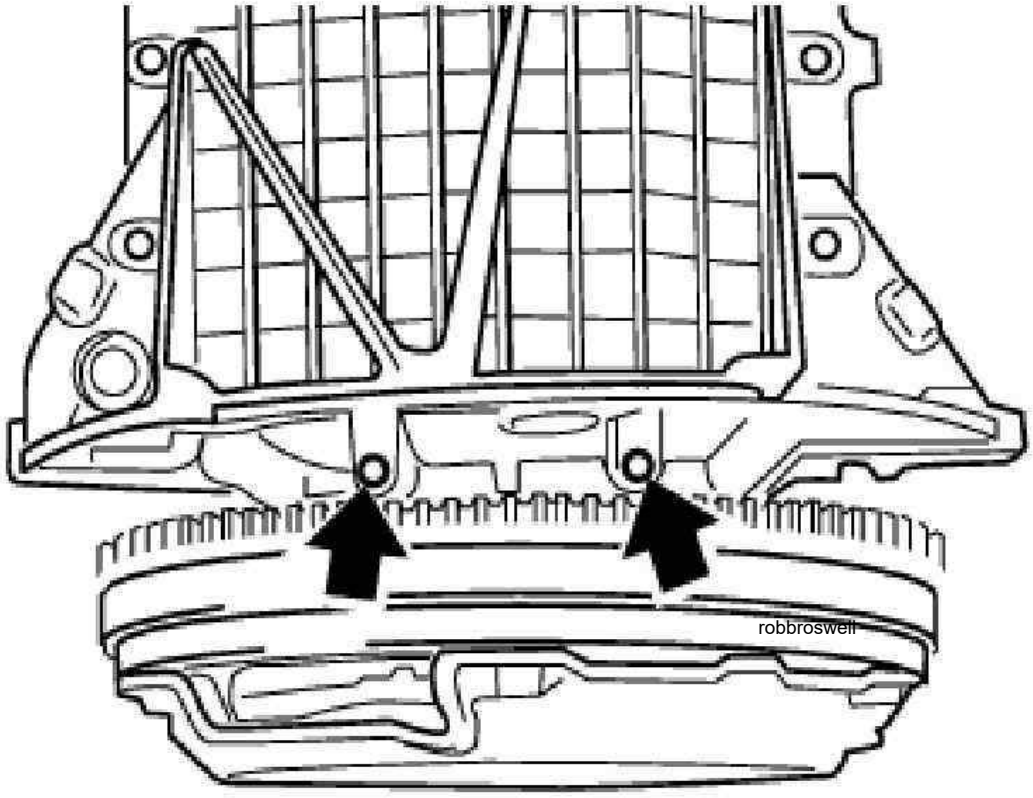
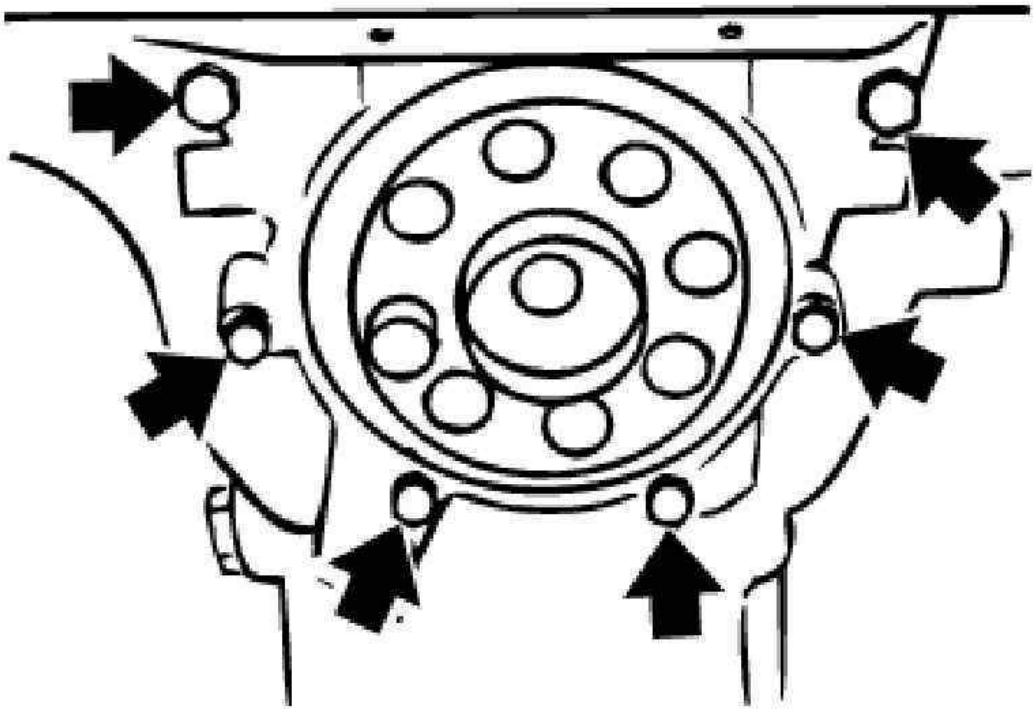


Fig. 66: Removing Oil Sump Screws On Transmission End
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws in end cover at rear.

Carefully detach oil sump gasket from end cover, remove end cover.

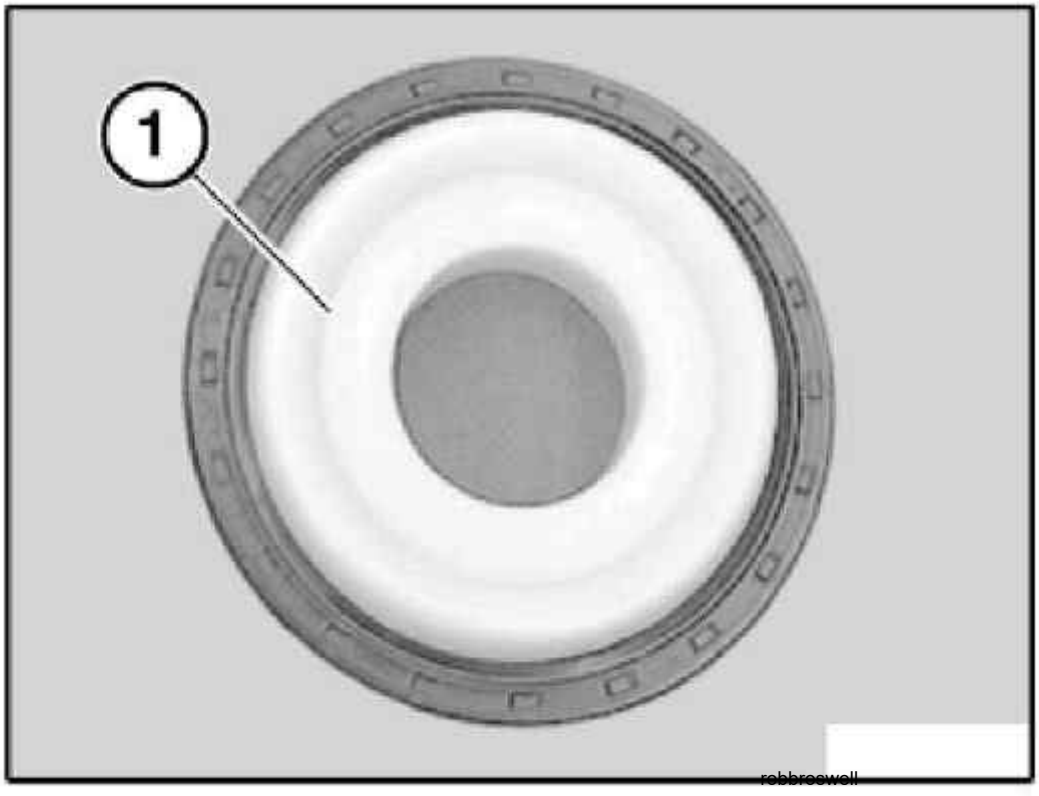
NOTE: After removing end cover:
check oil sump gasket for damage.
If necessary, remove oil sump and replace oil sump gasket.



robbroswell

Fig. 67: Releasing Screws In End Cover At Rear
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: As from 4/98, a new type of radial seal is used in the Series and as a replacement. This radial seal may only be supported with a "support bushing". If the radial seal is supported without the support bushing (1) for more than six months, operational reliability will no longer be assured and the radial seal must not be used any further.



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Fig. 68: Identifying Radial Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Distinguishing feature:

1. New version "without hose spring"
2. Old version "with hose spring"

IMPORTANT: The sealing lip of the new version (1) is very sensitive and must not be kinked under any circumstances. Do not touch the sealing lip with your fingers.

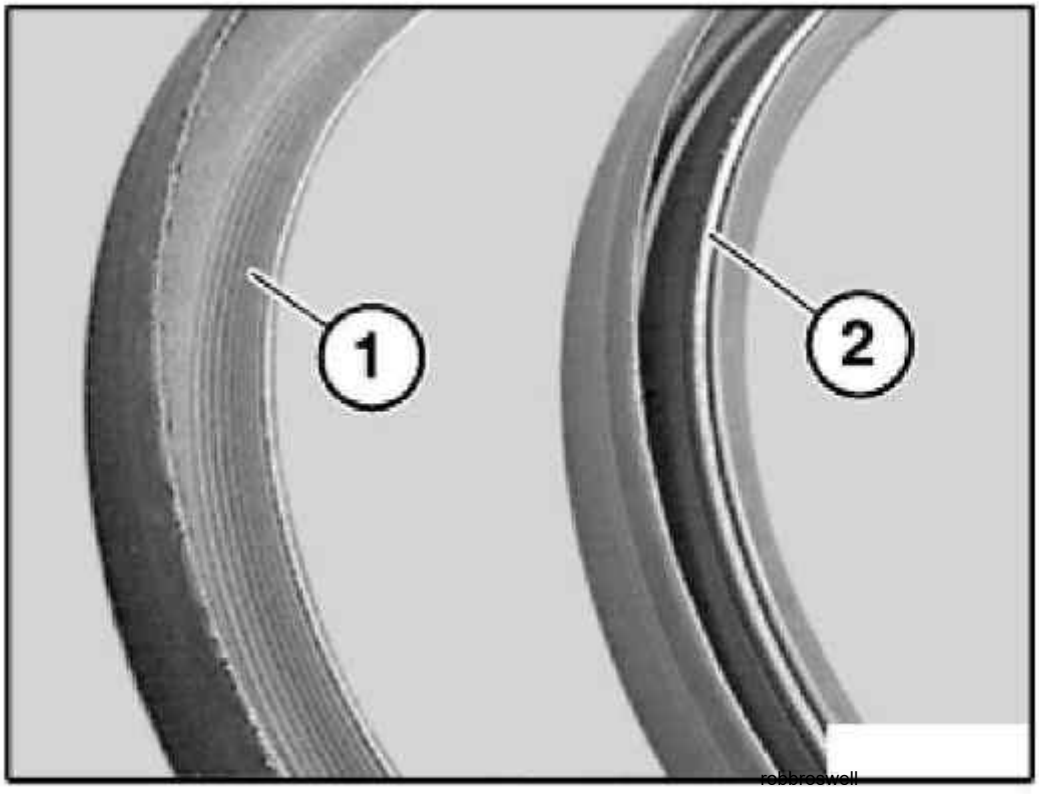


Fig. 69: Identifying Sealing Lip
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The end cover is offered in the kit with a radial seal.

If necessary, lift out the radial sealing ring and drive in new sealing ring using special tool 11 1 260 in conjunction with special tool 00 5 500.

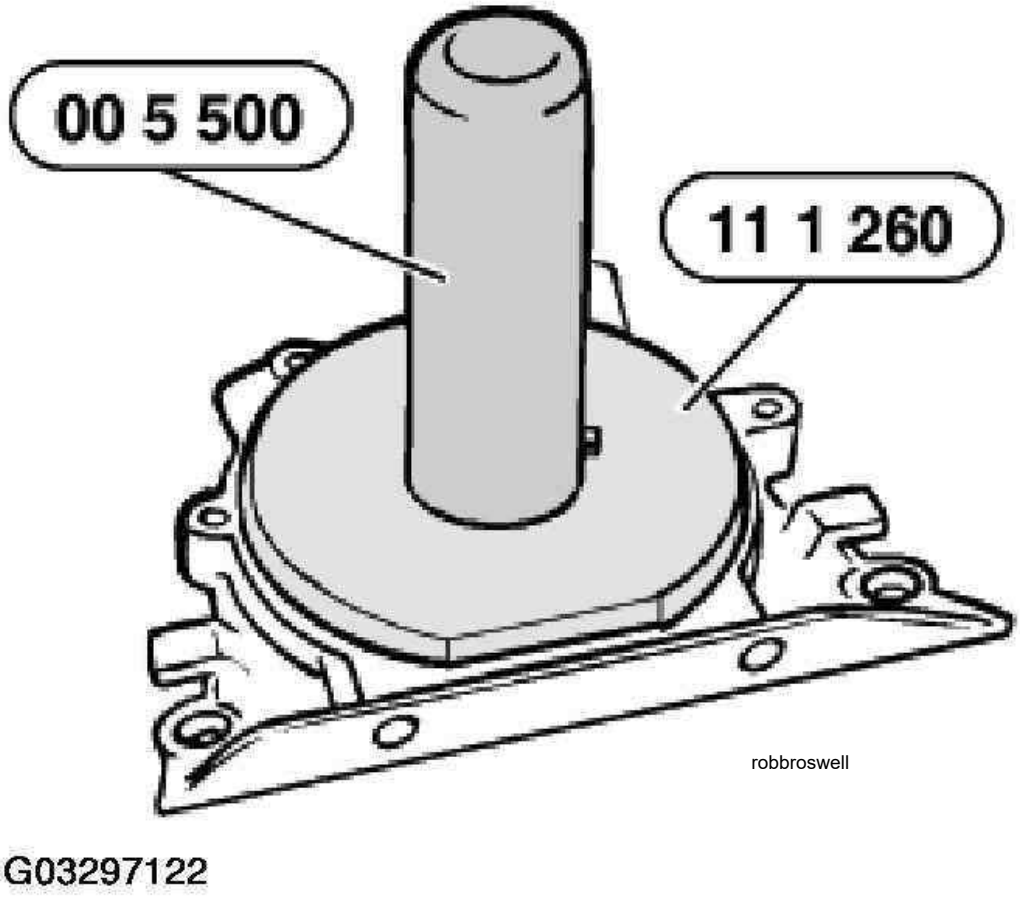


Fig. 70: Removing Radial Sealing Ring With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Check dowel sleeves (1) for damage and correct installation position.

Replace seal (2).

Apply thin, uniform coat of Drei Bond 1209 sealing compound to edges of joint on oil pan.

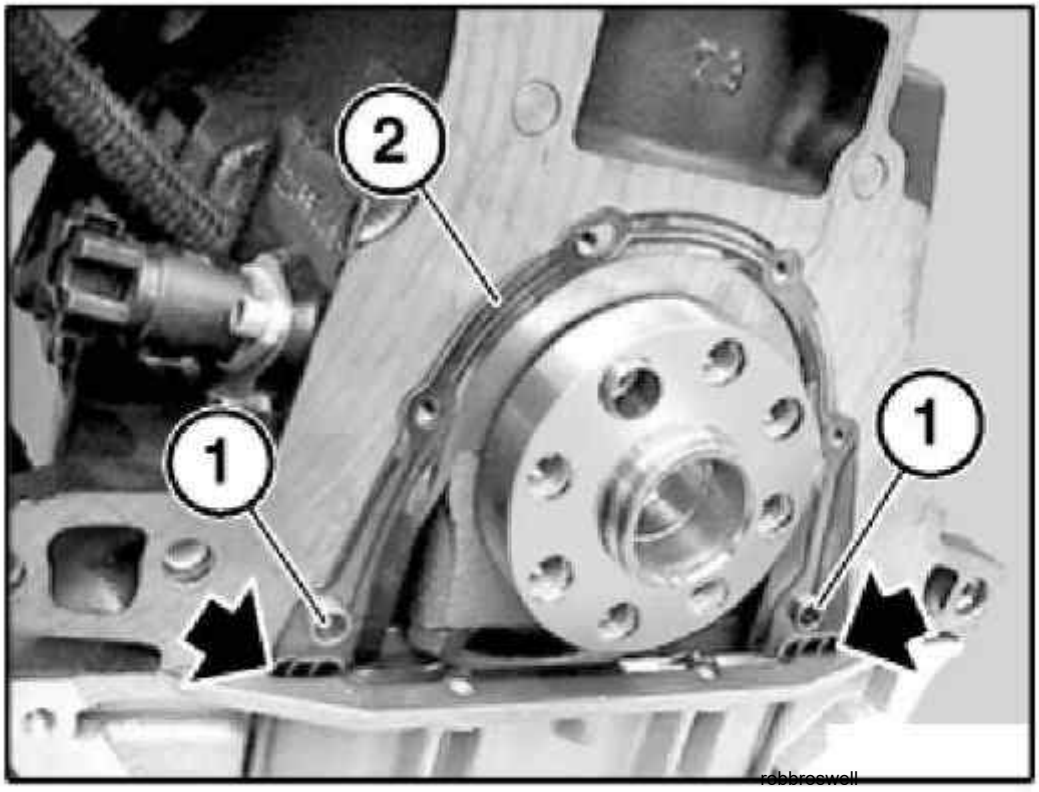


Fig. 71: Checking Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not use special tool 11 2 213 for the new radial seal version.

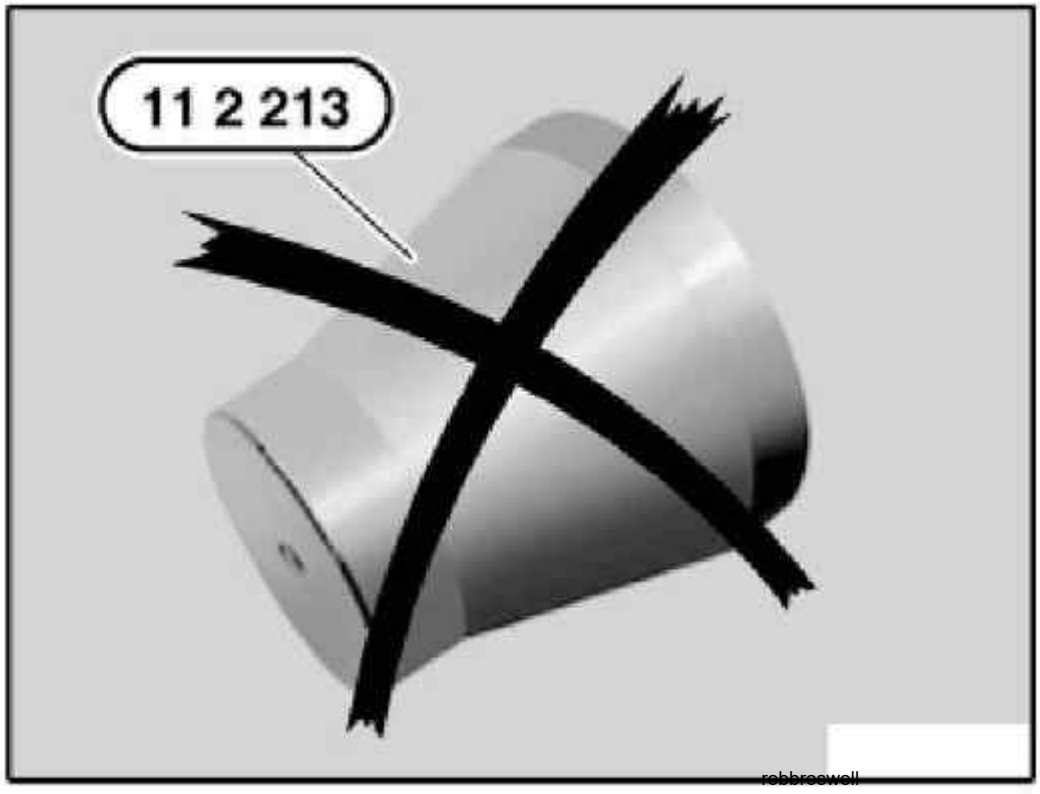


Fig. 72: Do Not Use Special Tool 11 2 213 For The New Radial Seal Version
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When fitting the end cover with radial seal on the crankshaft, it is only permitted to use the "support bushing (1)" as an installation tool.

Lubricate contact face of crankshaft.

IMPORTANT: Push on end cover with support bushing (1) straight and without tilting sideways.

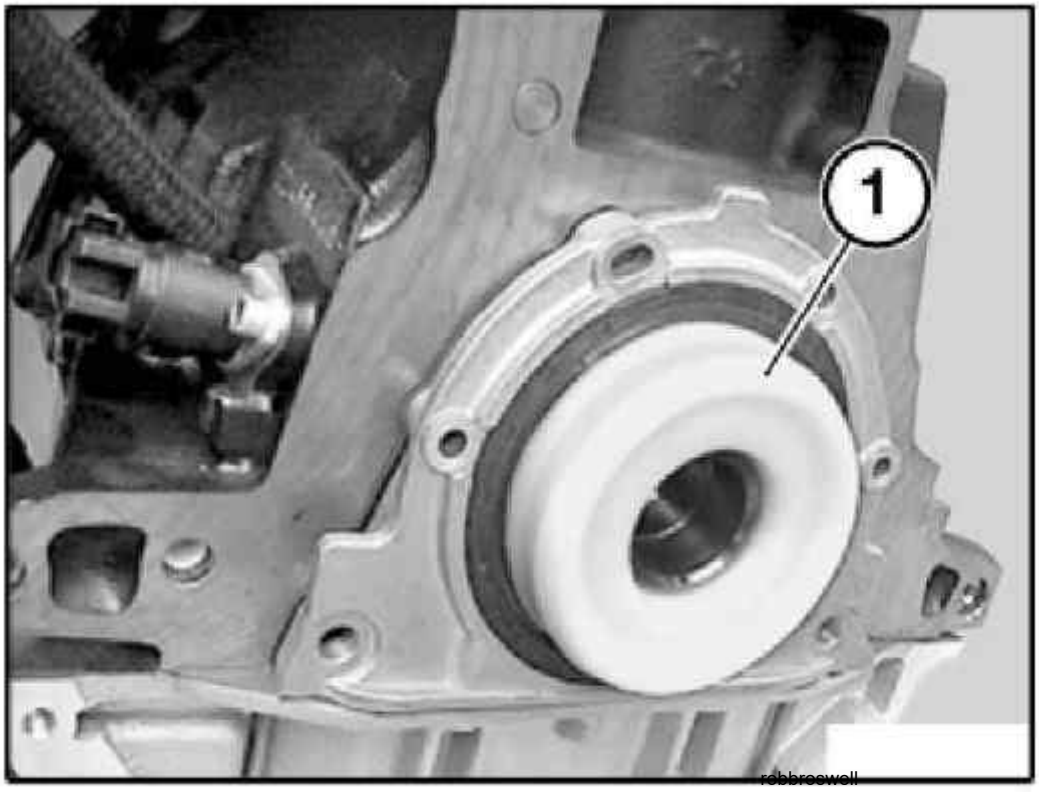


Fig. 73: Installing Radial Seal On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Screw threads (1) are coated with sealing compound.

Replace screws (1).

Insert all screws and tighten down end cover.

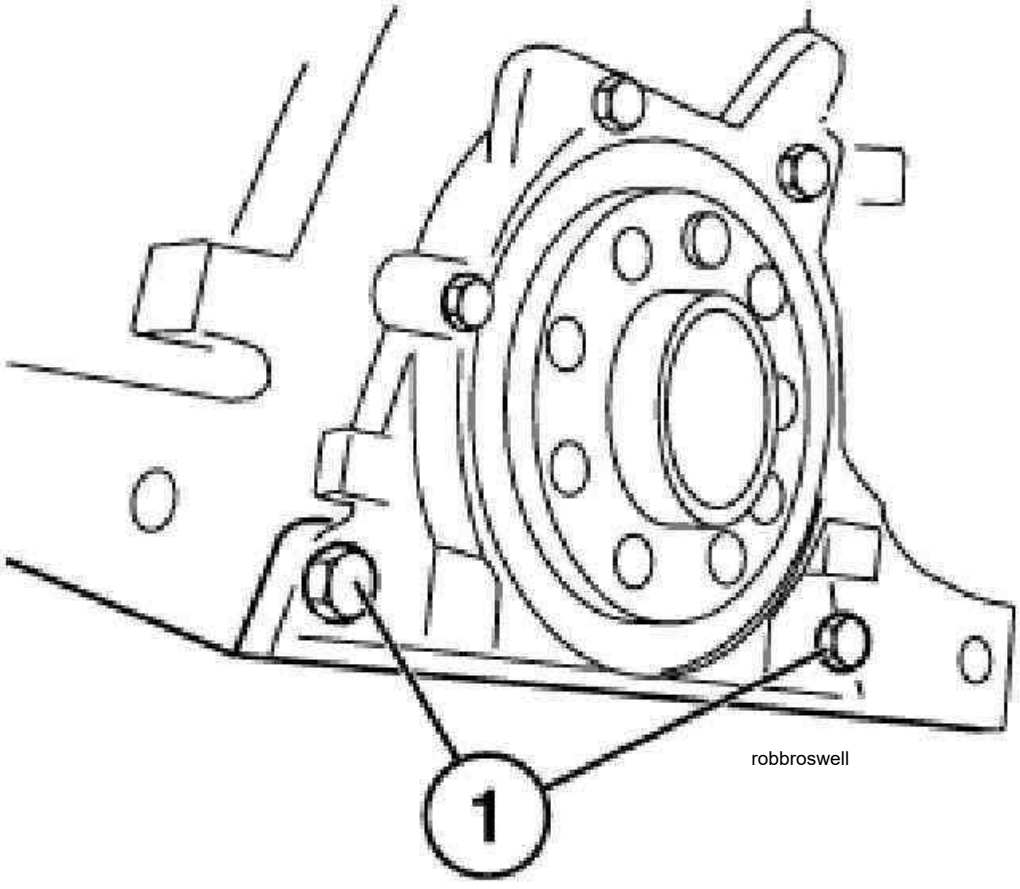
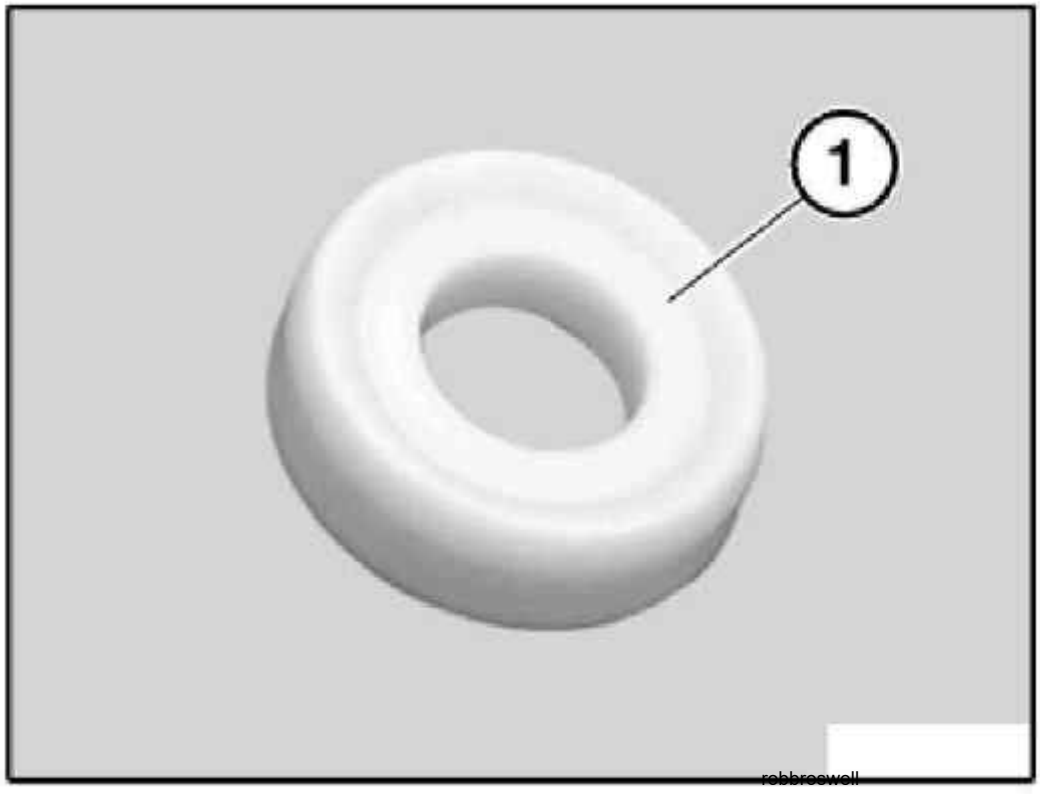


Fig. 74: Replacing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Keep the support bushing (1) of the new radial seal version as a "special tool", then render the special tool 11 2 213 unusable and dispose of it.
The old and new radial seal versions can be installed with the support bushing (1).



G03297127

Fig. 75: Identifying Support Bushing
Courtesy of BMW OF NORTH AMERICA, INC.

CRANKSHAFT WITH BEARING

11 21 500 REPLACING CRANKSHAFT (M52 / S52 / M52TU / M54 / M56)

(engine removed)

Necessary preliminary tasks:

- Removing cylinder head
- Removing lower timing case cover
- Removing all pistons
- Remove end cover at rear; this operation is described in the section Replacing crankshaft radial seal .

Checking axial clearance:

If permitted end float is exceeded, check crankshaft, guide bearing shells and engine block, replacing if necessary, end float .

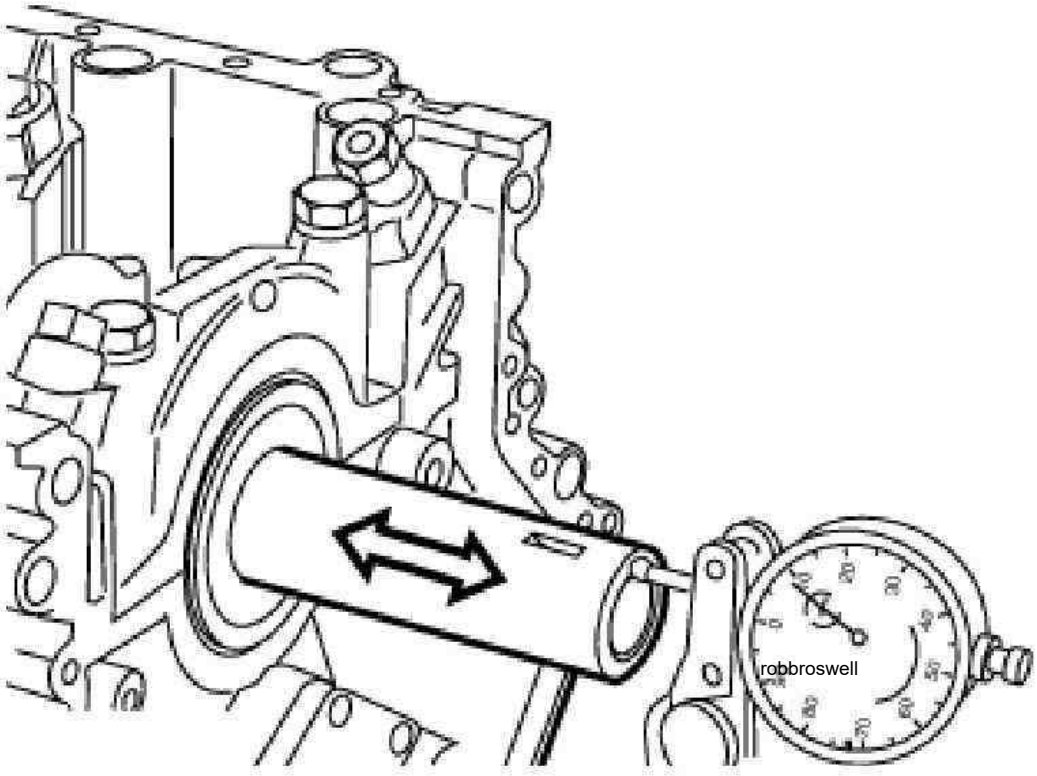


Fig. 76: Checking Axial Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw connection on reinforcement plates.

NOTE: The reinforcement plates are not fitted on engines with gray cast iron engine blocks or on engines with oil pumps integrated in oil scrapers.

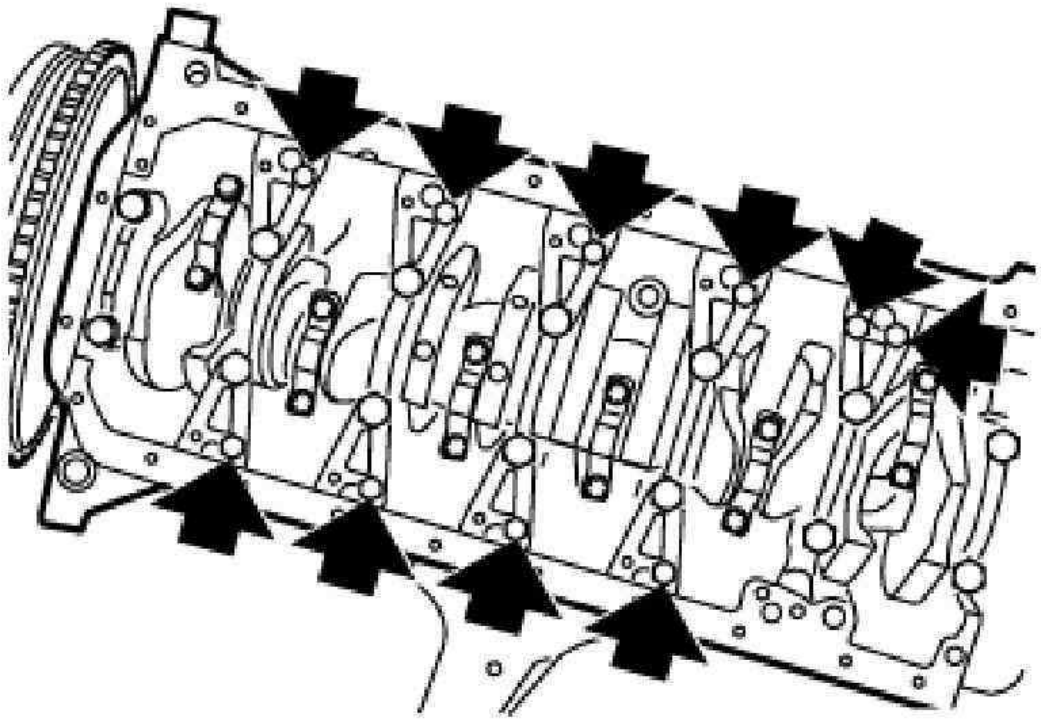


Fig. 77: Removing Screw Connection On Reinforcement Plates
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screw connection on main bearing.

Remove main bearing caps (1 to 7).

Lever out crankshaft.

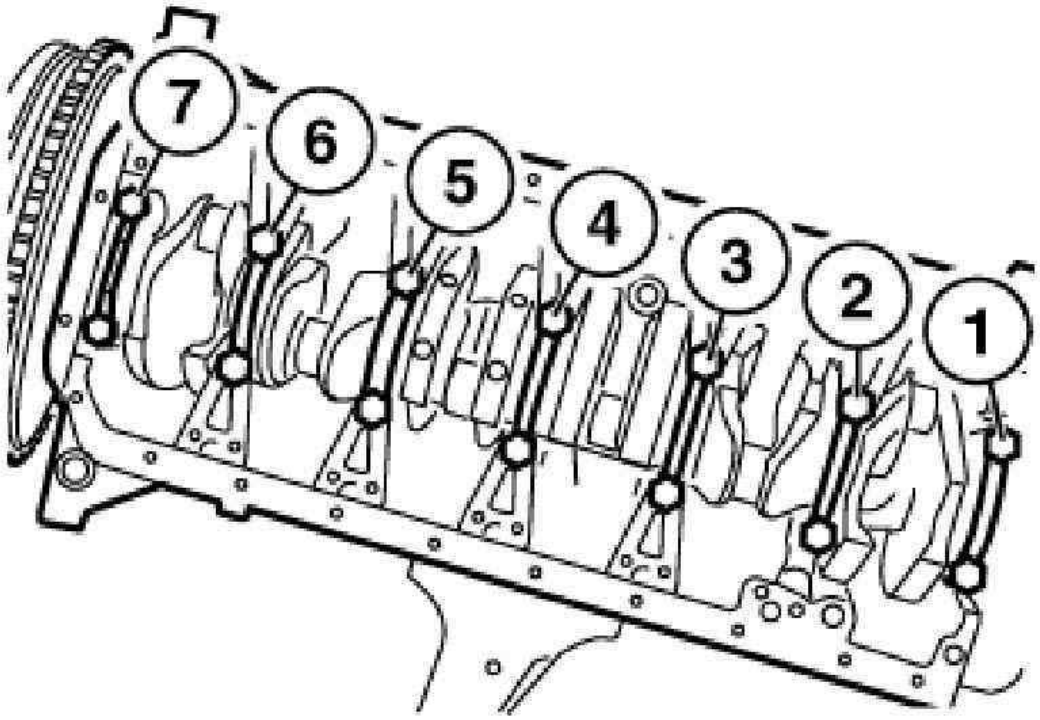


Fig. 78: Removing Main Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release incremental gear.

Installation:

Replace screws.

Install screws and tighten down in two passes.

Tightening torque, see 11 21 1AZ in **ENGINE - TIGHTENING TORQUES** .

IMPORTANT: Check grinding stage of crankshaft.

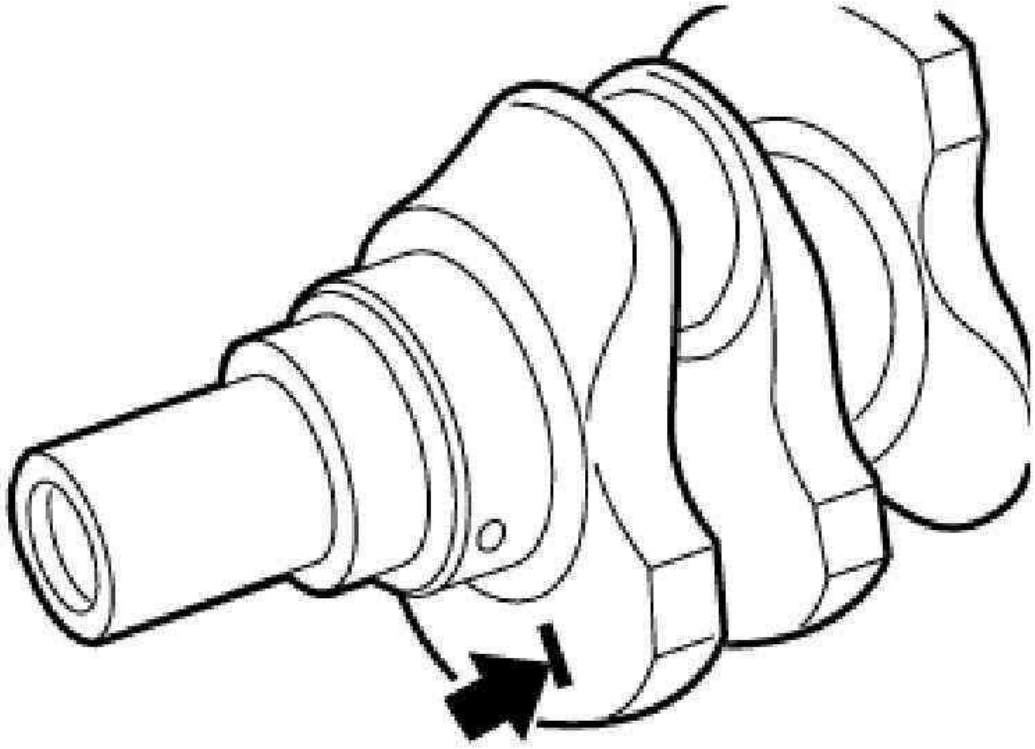


Fig. 79: Checking Grinding Stage Of Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Replace main crankshaft bearing shells . See .**11 21 531 Replacing All Main Crankshaft Bearing Shells (M52 / S52 / M52TU / M54 / M56)**

Replace conrod bearing shells . See **11 24 571 Replacing all connecting rod bearings (M52 / S52 / M52TU / M54 / M56)**.

Replace grooved ball bearings in crankshaft . See **11 21 571 Replacing Grooved Ball Bearing In Crankshaft (M52 / S52 / M52TU / M54 / S50 / S54)**.

11 21 531 REPLACING ALL MAIN CRANKSHAFT BEARING SHELLS (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 00 2 590

- 00 9 120
- 11 2 110

(engine dismantled)

M52 B20 / M52TU B20 M54 M22

NOTE: Injection nozzles for cooling the pistons are installed in the bores of bearing seats 2 to 7.

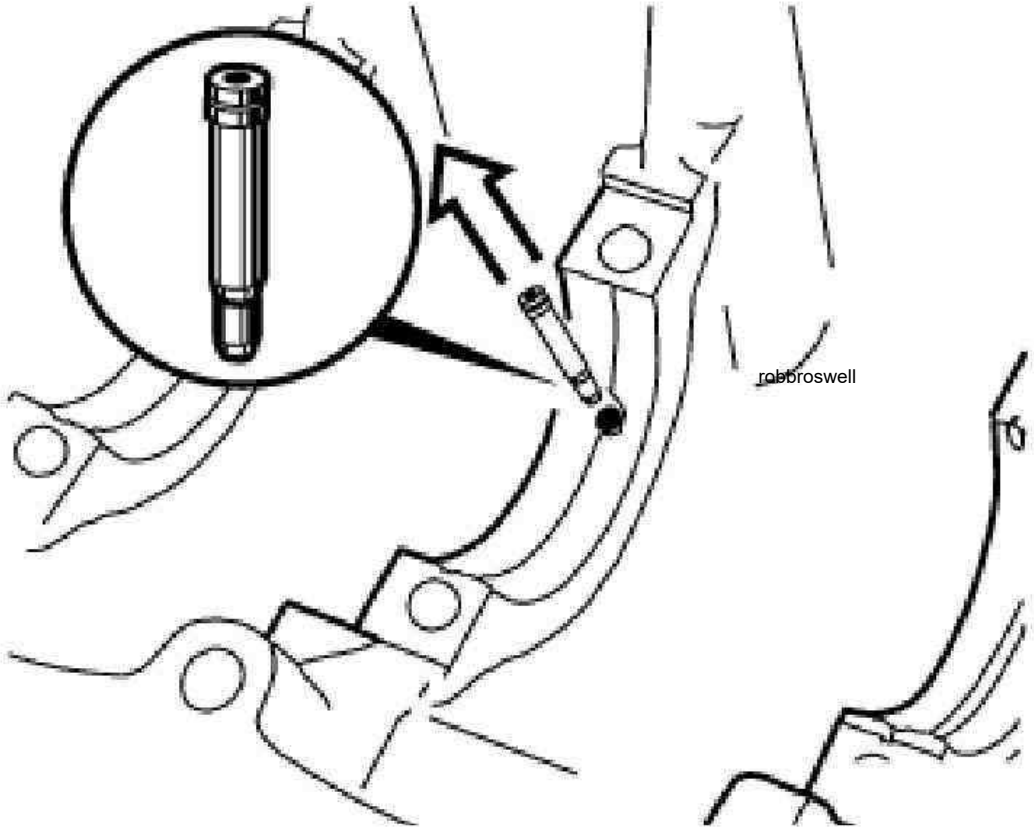


Fig. 80: Identifying Injection Nozzles For Cooling Pistons
Courtesy of BMW OF NORTH AMERICA, INC.

M52 B25 / B28

S52 M52TU B25 / B28

M54 B25 / B30

M56

NOTE: Injection nozzles for cooling the pistons are installed on the underside of the cylinder between the bearing seats.

Installation:

Screw threads are coated with screw securing adhesive (Loctite).

Replace screws.

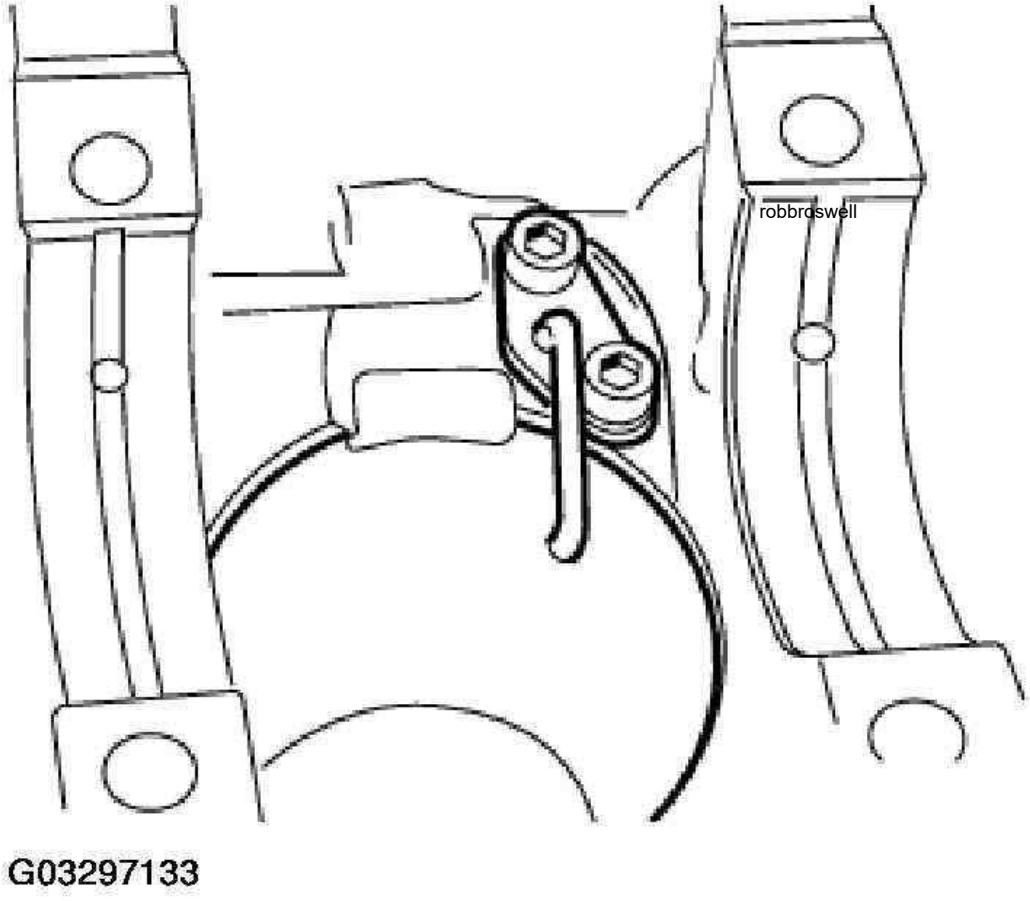


Fig. 81: Identifying Injection Nozzles For Cooling Pistons

Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Observe grinding stage of crankshaft. See

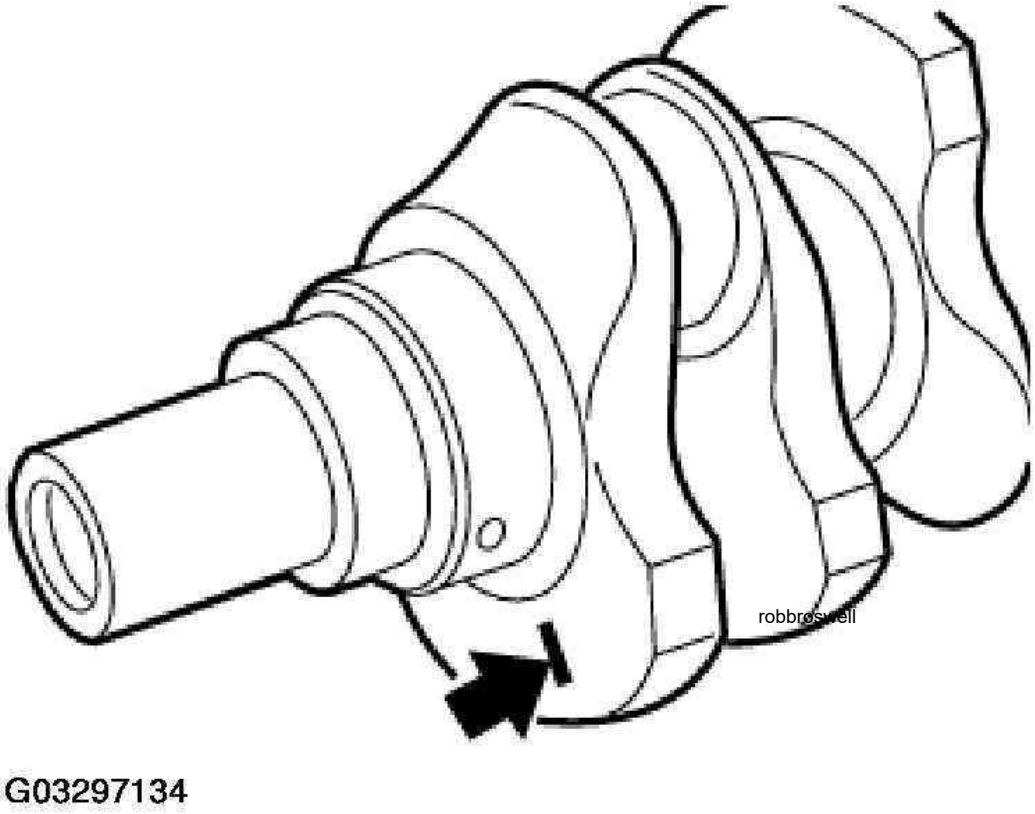


Fig. 82: Identifying Grinding Stage Of Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

When replacing the bearing shells (also for replacement crankshaft), classification for bearing shell arrangement in engine block is waived.

Insert bearing shells with yellow color coding in engine block.

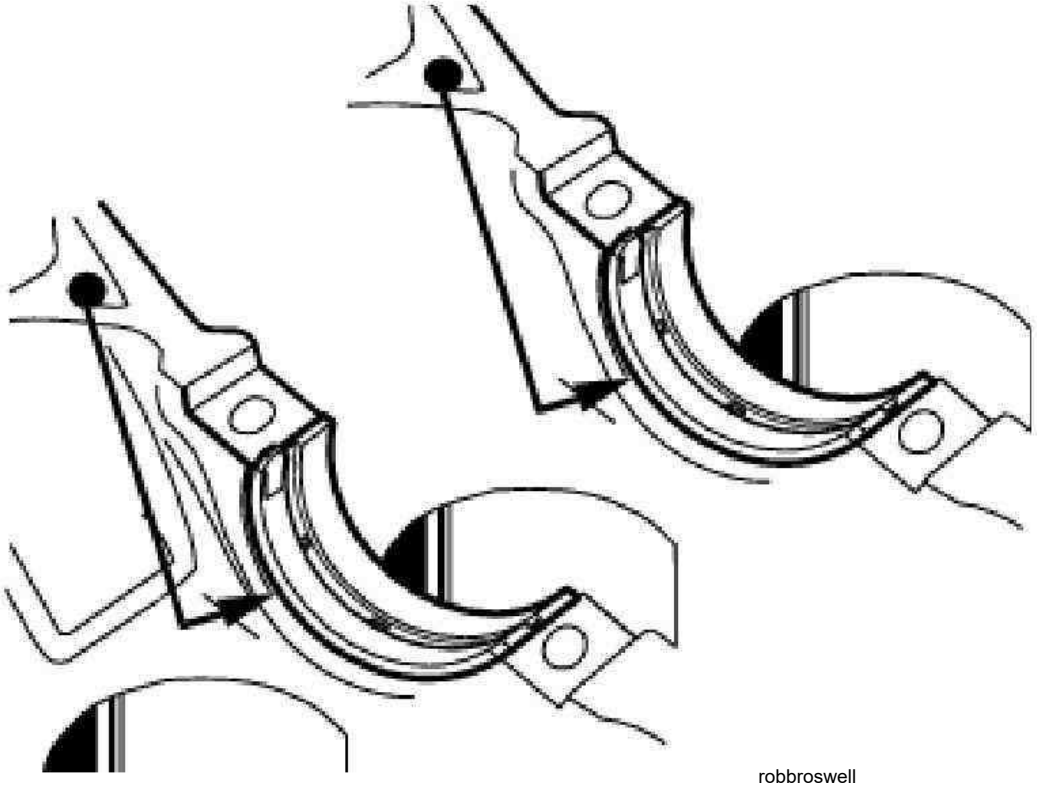


Fig. 83: Inserting Bearing Shells In Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE:

1. **Install bearing shells with continuous lubricant groove and one retaining lug in engine block.**
2. **Fit bearing shells without continuous lubricant groove and two retaining lugs in bearing cover.**

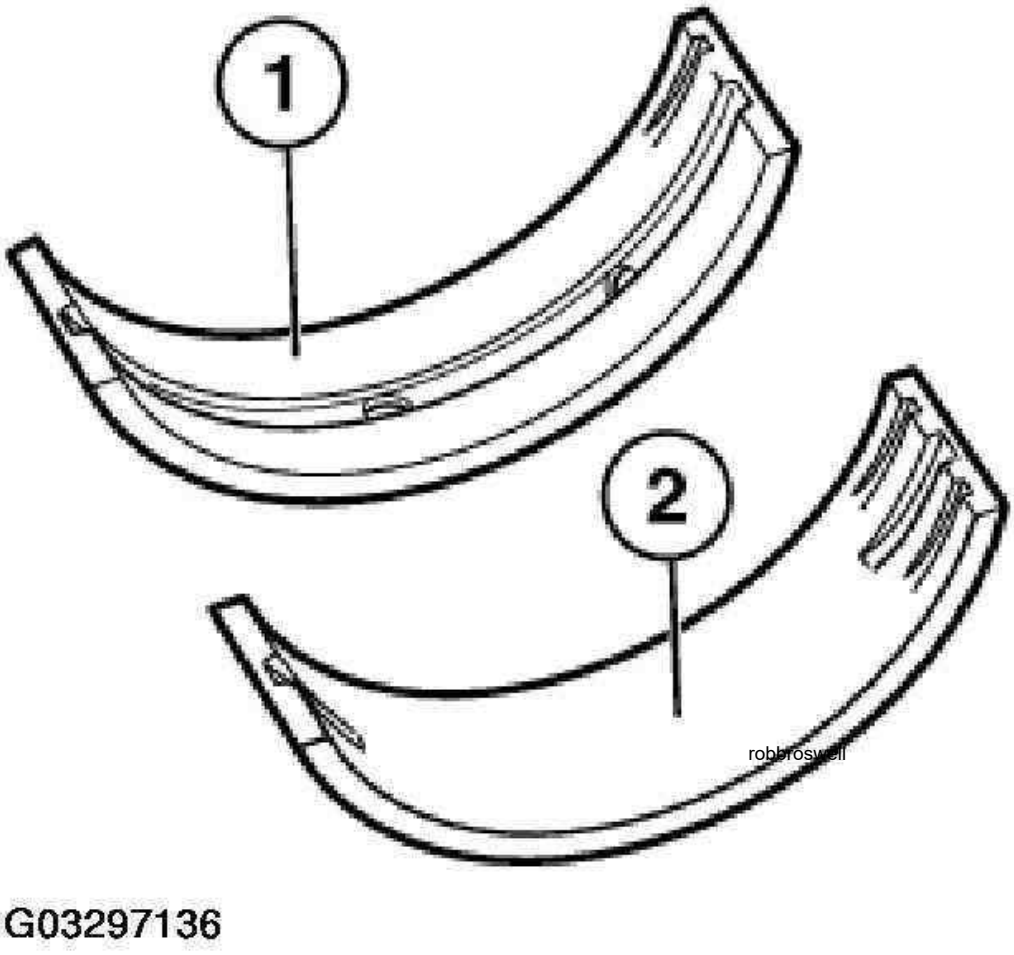


Fig. 84: Identifying Bearing Shells
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The axial guide on the crankshaft is fitted to bearing point 6. Insert pilot bearing shell in the engine block.

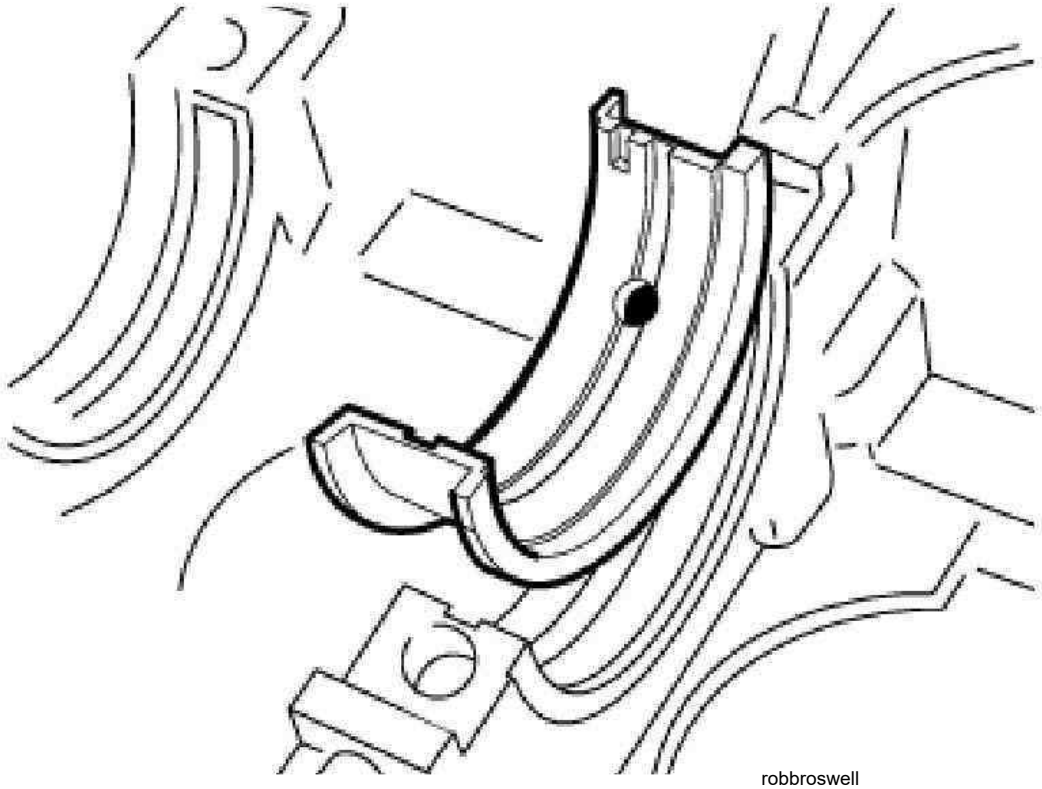


Fig. 85: Inserting Pilot Bearing Shell In Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

Install crankshaft.

NOTE: The crankshaft is marked with yellow, green or white paint according to the tolerance of the main journal.

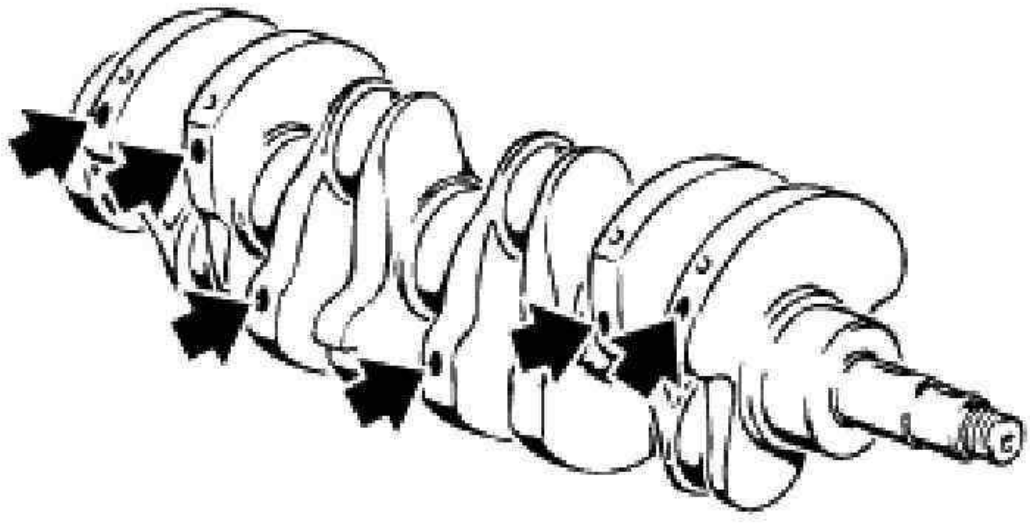


Fig. 86: Identifying Crankshaft Mark
Courtesy of BMW OF NORTH AMERICA, INC.

robbroswell

Installation:

The bearing shell classification for the bearing cover is marked on the crankshaft in yellow, green or white paint.

Insert main bearing shells with same crankshaft color coding in main bearing caps.

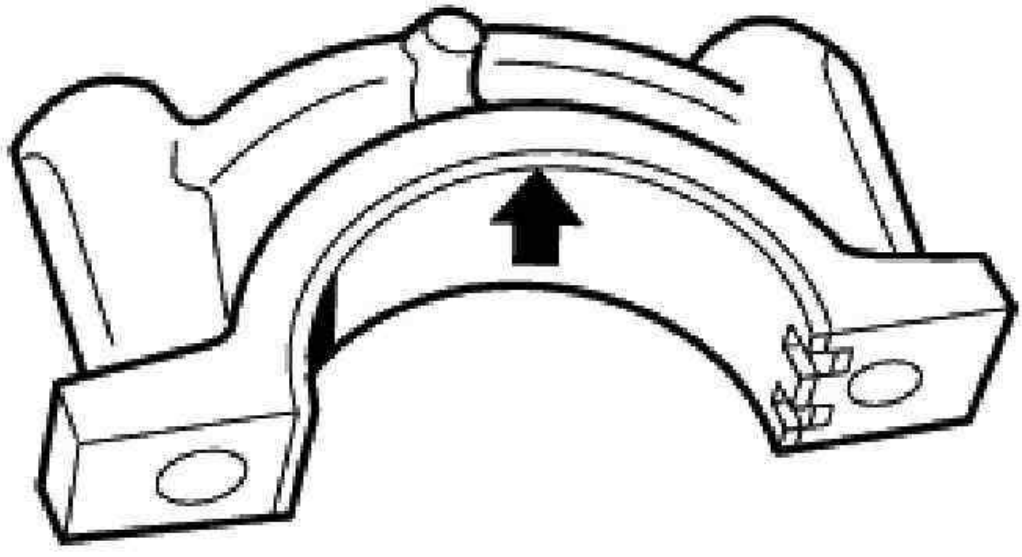
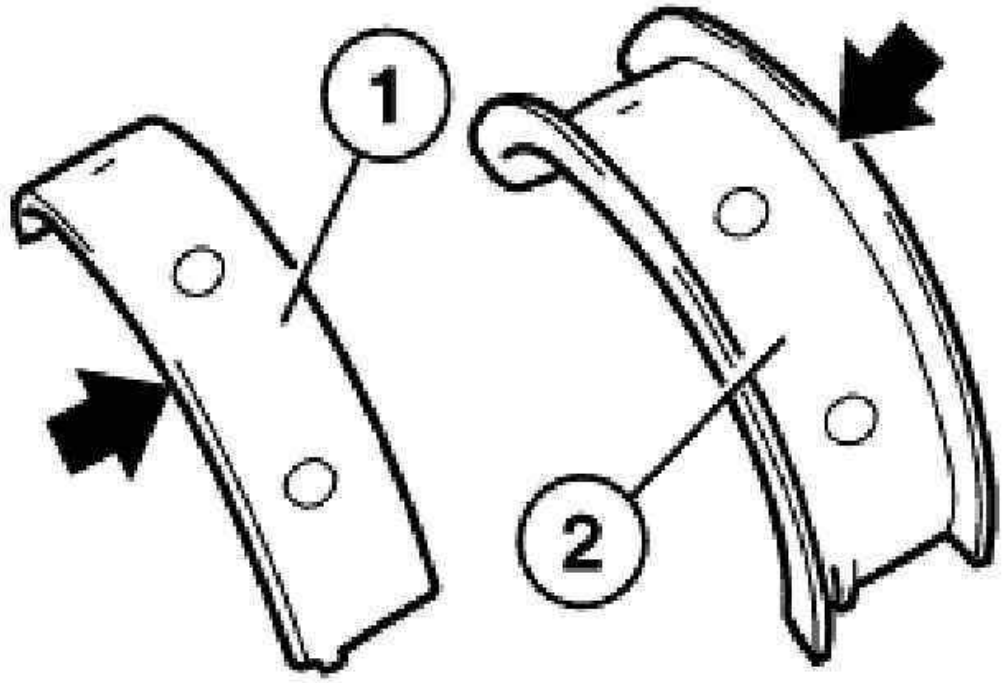


Fig. 87: Inserting Main Bearing Shells In Main Bearing Caps broswell
Courtesy of BMW OF NORTH AMERICA, INC.

The bearing shells are marked with yellow, green or white paint.

1. Bearing shell
2. Guide bearing

Observe grinding stage of main bearing journals . See **Fig. 79**.



1. Bearing shell

robbroswell

2. Guide bearing

G03297140

Fig. 88: Identifying Bearing Shell And Guide Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Bearing caps 1 to 5 are marked on exhaust side.
Bearing caps 6 and 7 are not designated.
Bearing cap 6 is a thrust bearing.

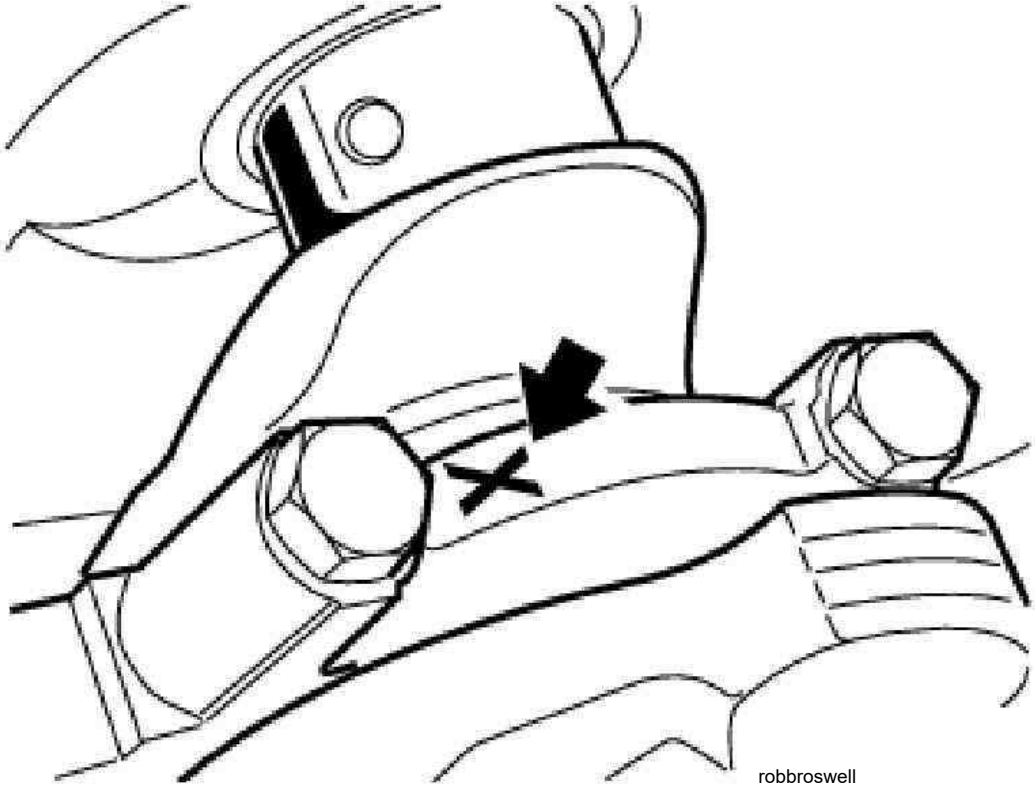


Fig. 89: Identifying Bearing Caps Mark On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Check clearance on main crankshaft bearing.

Install crankshaft and place special tool 00 2 590 (Plastigage Type PG1) on oil-free crankshaft.

Do not twist crankshaft.

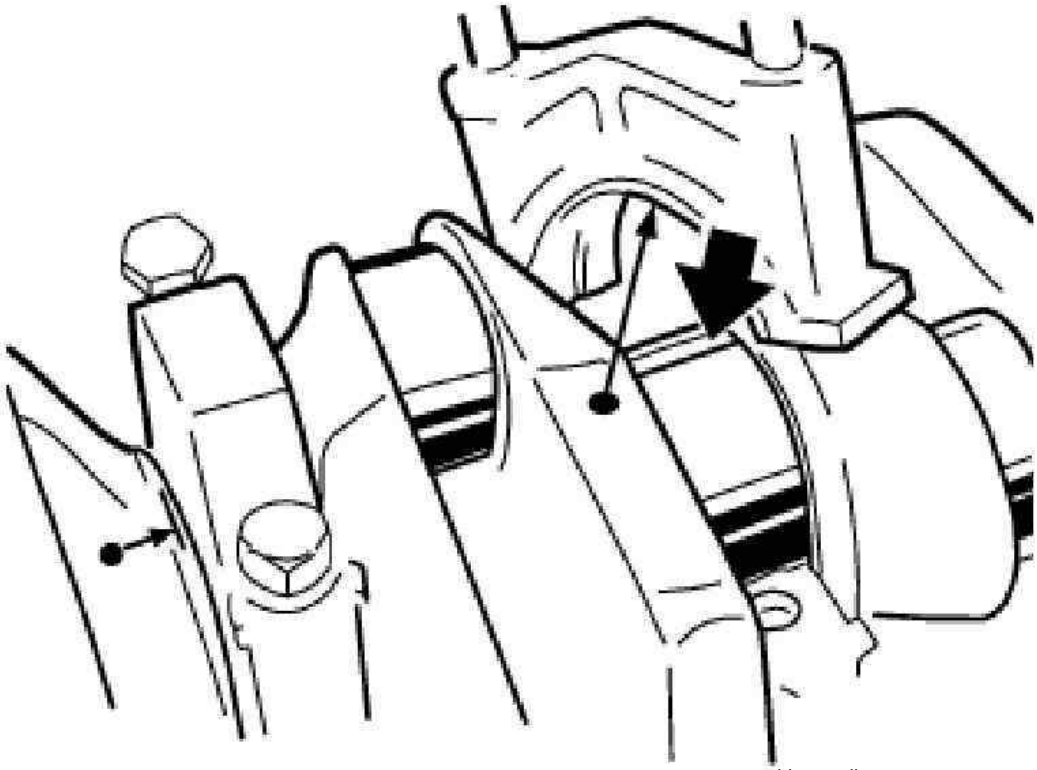


Fig. 90: Installing Crankshaft And Placing Plastigage On Crankshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Install main bearing cap so that grooves in main bearing shell guide are one side.

Align main bearing cap flush with side of bearing seat.

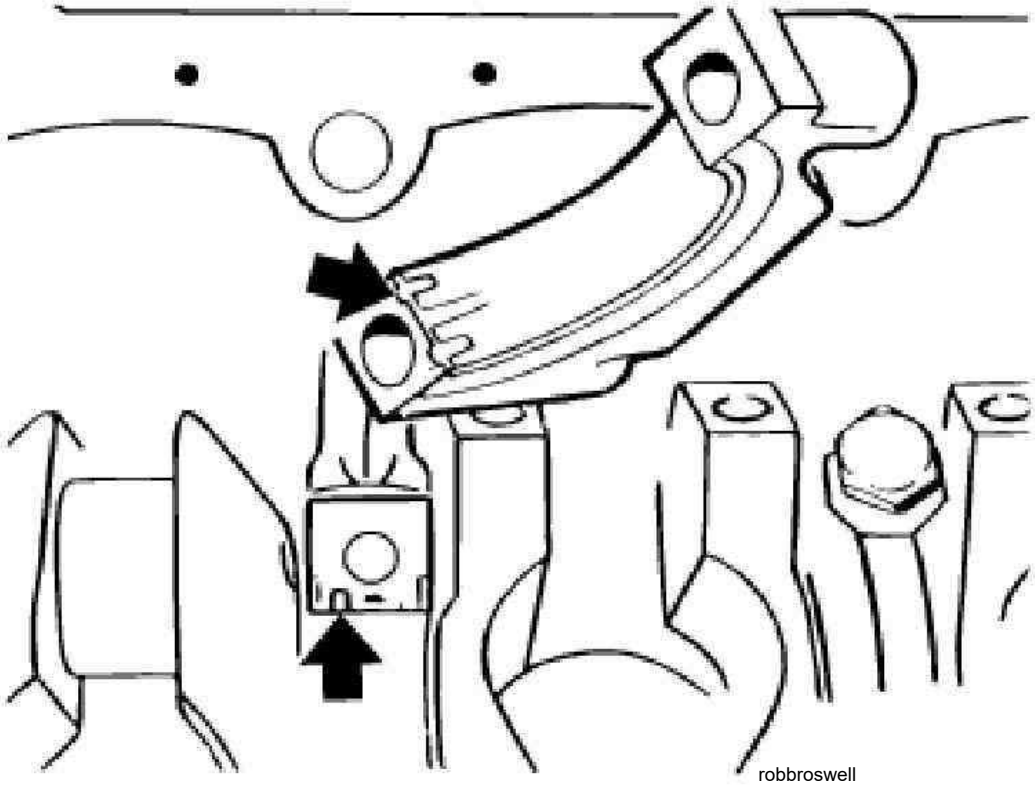


Fig. 91: Aligning Main Bearing Cap Flush With Side Of Bearing Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

To check main bearing clearance, use the old main bearing screws.

There must be no oil in the blind holes (risk of cracking).

1. Tighten down main bearing screws with jointing torque.
2. Tighten down main bearing bolts with special tool 00 9 120 to angle of rotation.

Tightening torque, see 11 11 1AZ in **ENGINE - TIGHTENING TORQUES** .

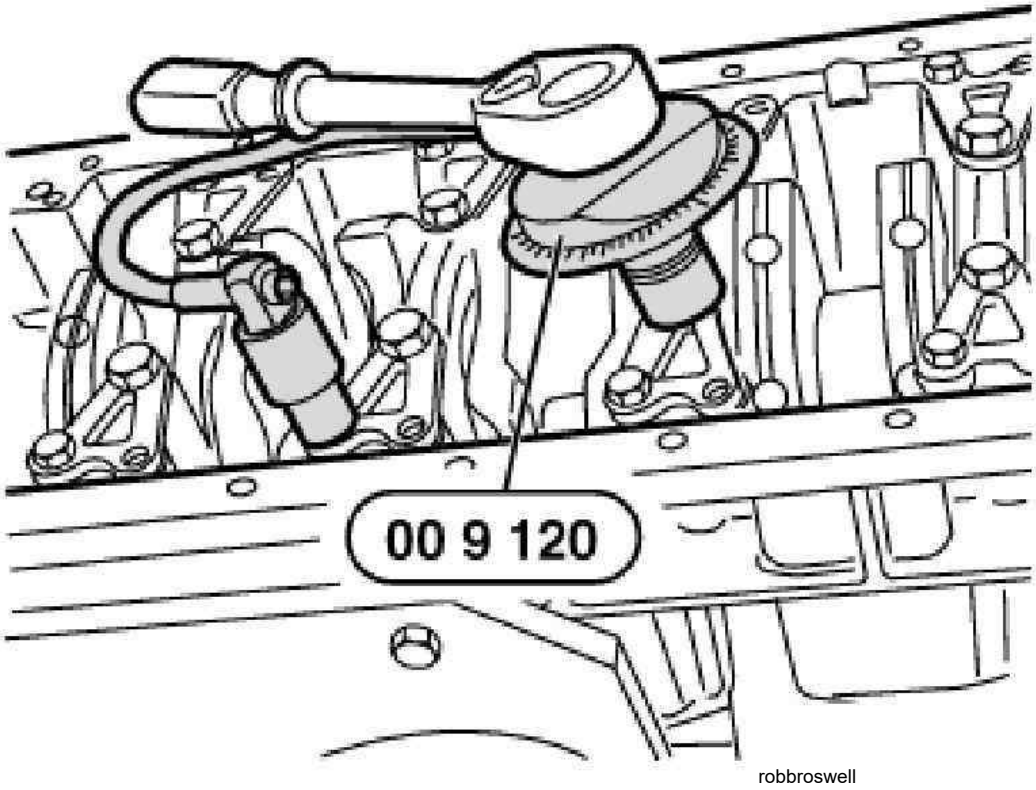


Fig. 92: Tightening Down Main Bearing Screws With Jointing Torque
Courtesy of BMW OF NORTH AMERICA, INC.

Remove main bearing cap and read off bearing clearance at width of pinched plastic thread on measuring scale.

Radial crankshaft bearing clearance .

If necessary, to correct bearing clearance, fit new bearing shells with a different color coding.



Fig. 93: Checking Radial Crankshaft Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

Remove plastic thread.

Coat main bearing shells and crankshaft with engine oil.

Install main bearing cap so that grooves in main bearing shell guide are one side.

Align main bearing cap flush with side of bearing seat.

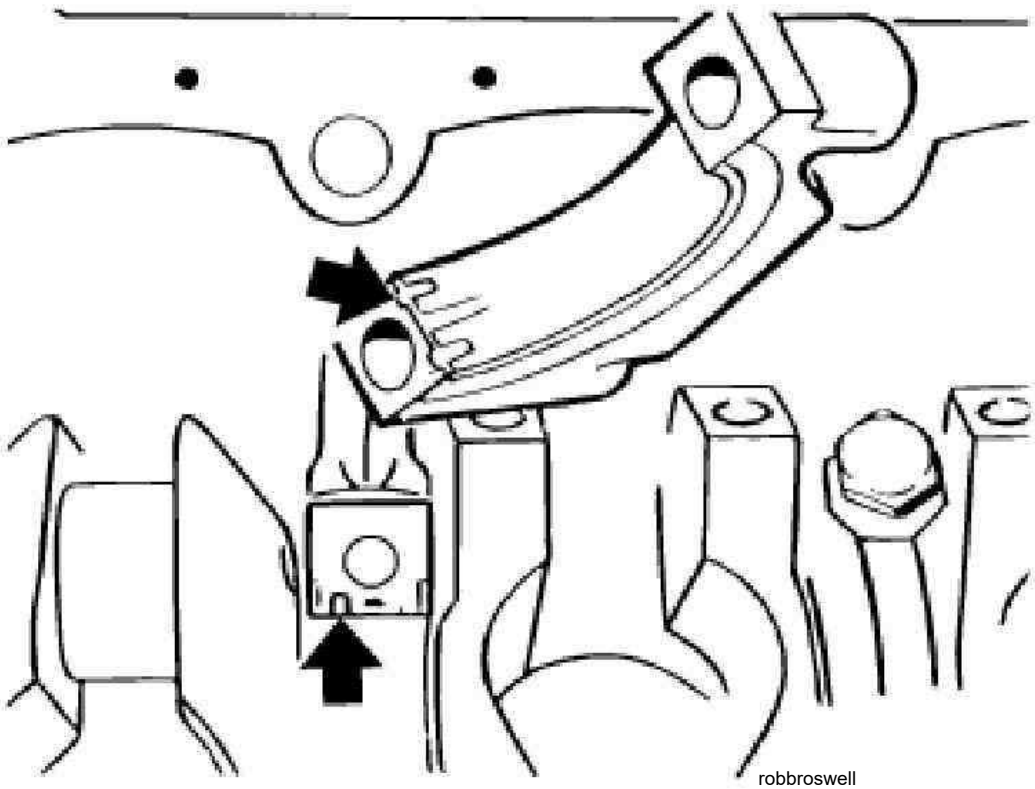


Fig. 94: Aligning Main Bearing Cap Flush With Side Of Bearing Seat
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Always replace bolts of main bearing cap with new bolts.

There must be no oil in the blind holes (risk of cracking).

NOTE: The reinforcement plates are not fitted on engines with gray cast iron engine blocks or on engines with oil pumps integrated in oil scrapers.

Installation:

Install reinforcement plates and fit screws with zero backlash.

Install main bearing shells and abut firmly.

Tighten down screw connection on reinforcement plates.

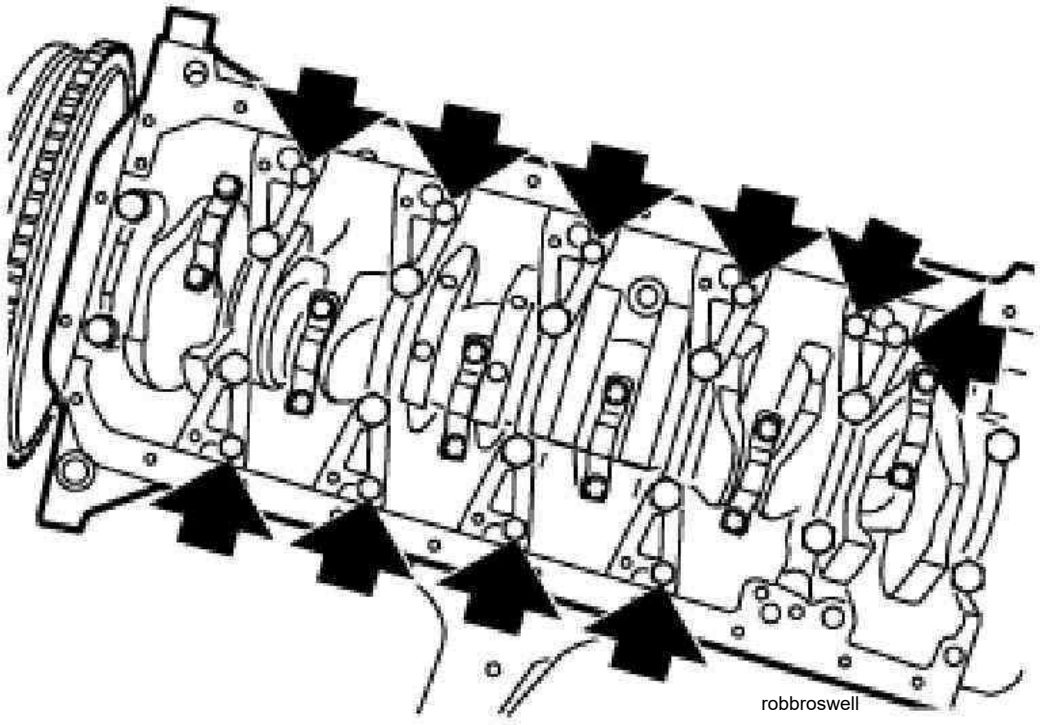


Fig. 95: Installing Reinforcement Plates And Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Tightening specifications for main bearing:

1. Tighten all screws on main bearing cover with jointing torque.
2. Unfasten screws on main bearing cover 6.
3. Strike back and front of crankshaft with plastic hammer to center thrust bearing (do not damage crankshaft).
4. Tighten screws of main bearing cover 6 with jointing torque.
5. Tighten down all screws of main bearing caps with special tool 11 2 110 or with special tool 00 9 120 to torsion angle.

   Tightening torque, see 11 11 1AZ in **ENGINE - TIGHTENING TORQUES** .

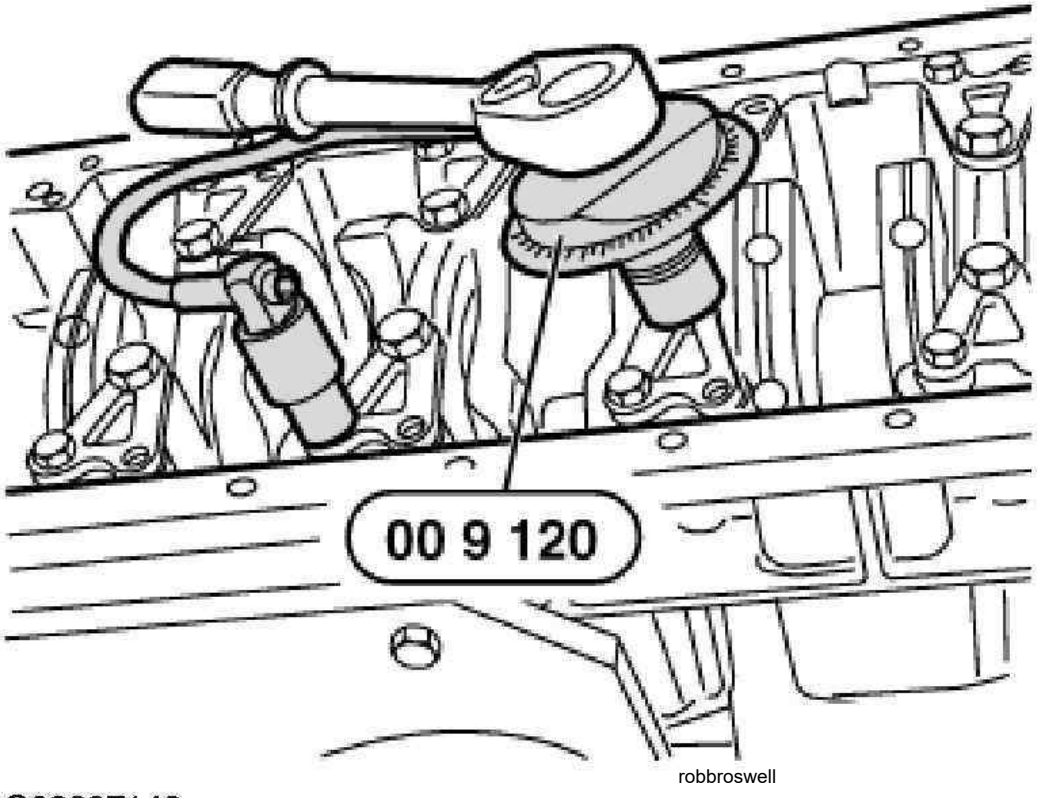


Fig. 96: Tightening Screws Of Main Bearing Cover 6 With Jointing Torque
Courtesy of BMW OF NORTH AMERICA, INC.

Check axial play.

If permitted end float is exceeded, check crankshaft, guide bearing shells and engine block, replacing if necessary, end float .

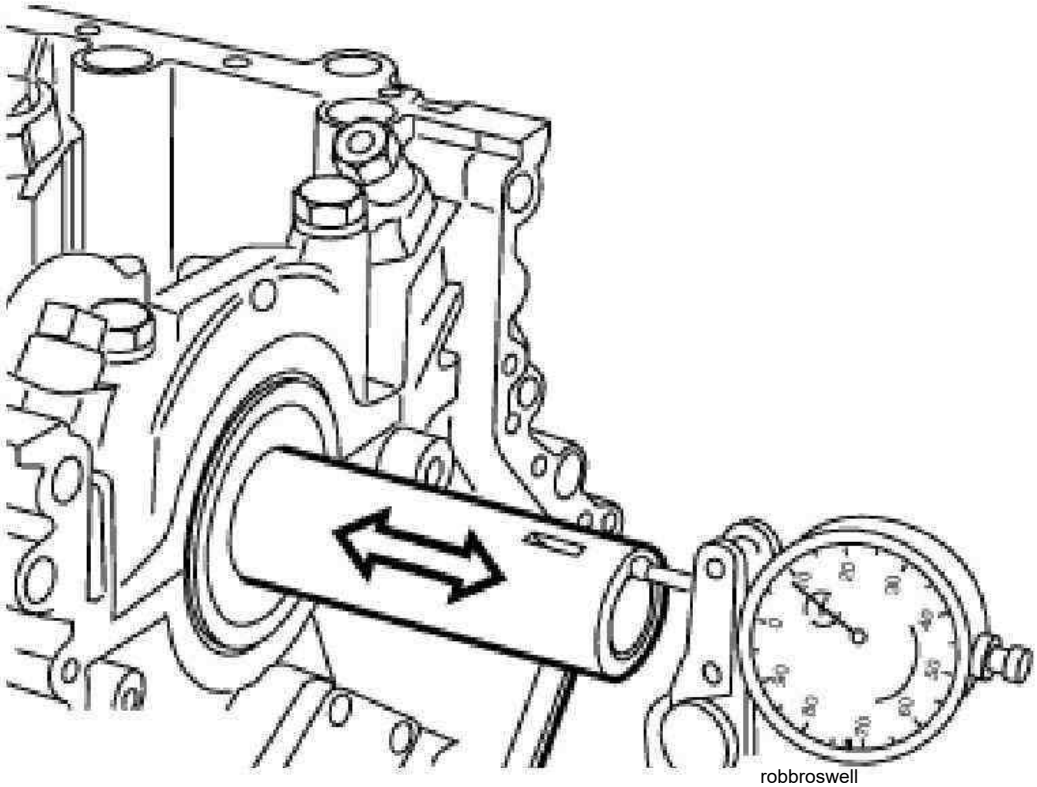


Fig. 97: Checking Axial Play
Courtesy of BMW OF NORTH AMERICA, INC.

11 21 571 REPLACING GROOVED BALL BEARING IN CRANKSHAFT (M52 / S52 / M52TU / M54 / S50 / S54)

Special tools required:

- 00 5 500
- 11 2 340
- 11 2 350

(clutch removed)

IMPORTANT: In version with needle bearing (1) in dual-mass flywheel (2), no grooved ball bearing may be fitted in the crankshaft.

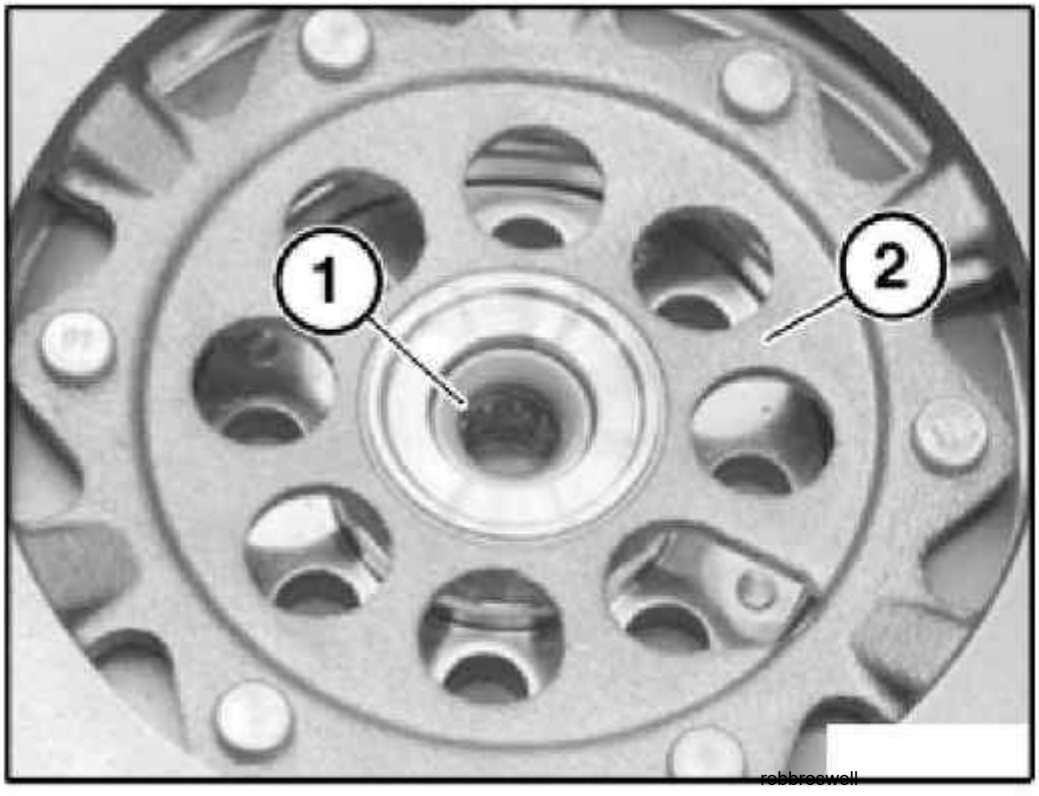
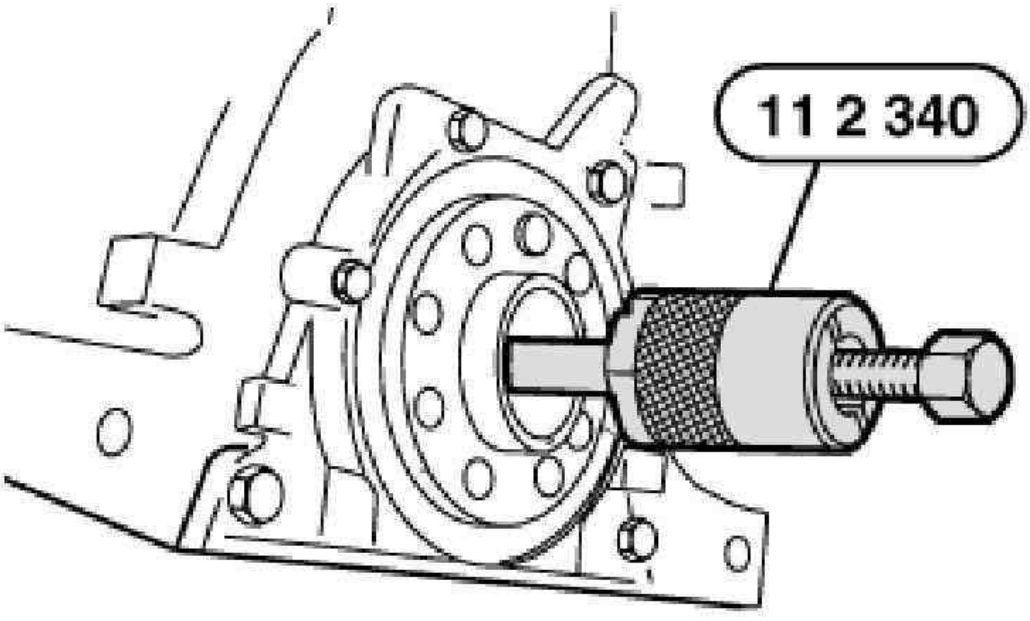


Fig. 98: Identifying Needle Bearing In Dual-Mass Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Version with grooved ball bearing:

Remove guide bearing with special tool 11 2 340.



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Fig. 99: Removing Guide Bearing With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Install new thrust bearing and drive firmly home with special tool 11 2 350 in conjunction with special tool 00 5 500.

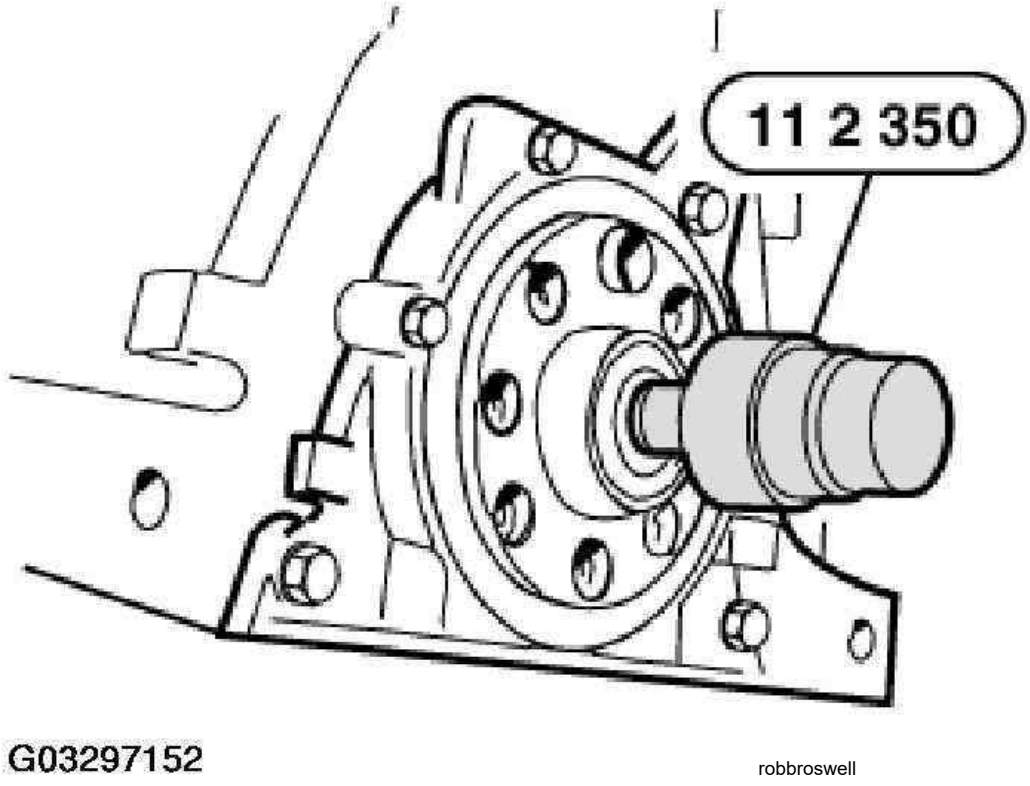


Fig. 100: Installing Thrust Bearing
Courtesy of BMW OF NORTH AMERICA, INC.

FLYWHEEL

11 22 500 REMOVING AND INSTALLING OR REPLACING FLYWHEEL (M52 / S52 / M52TU / M54 / S54)

Special tools required:

- 11 2 170

(clutch removed)

Lock flywheel with special tool 11 2 170.

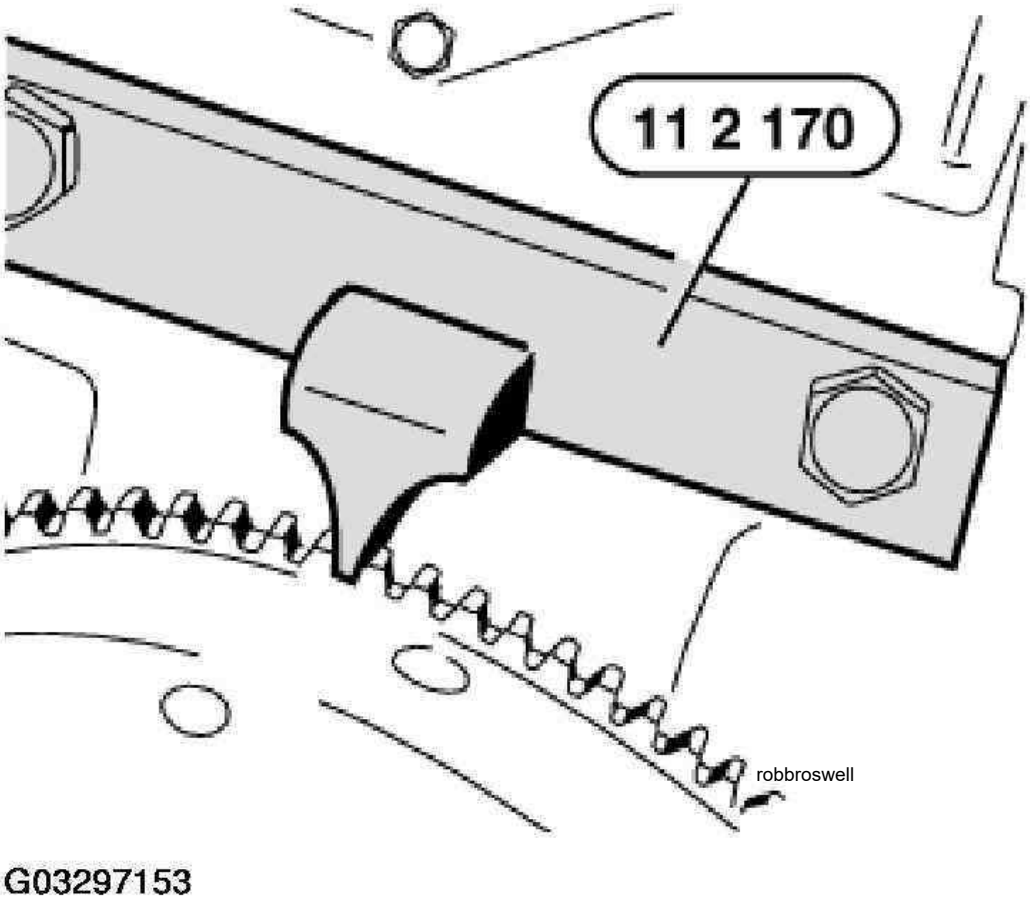


Fig. 101: Locking Flywheel With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws and remove flywheel.

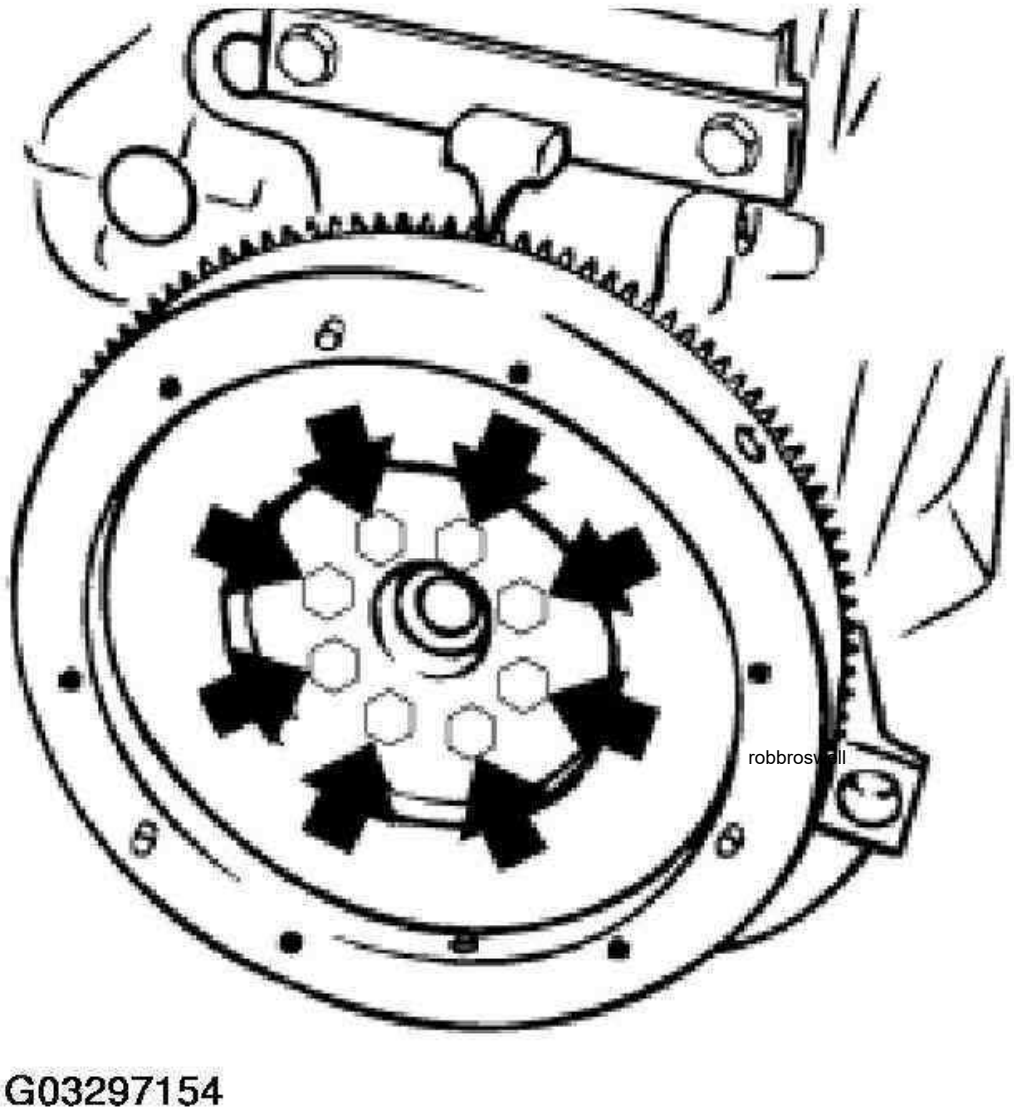


Fig. 102: Removing Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check dowel sleeve for damage and correct installation position.

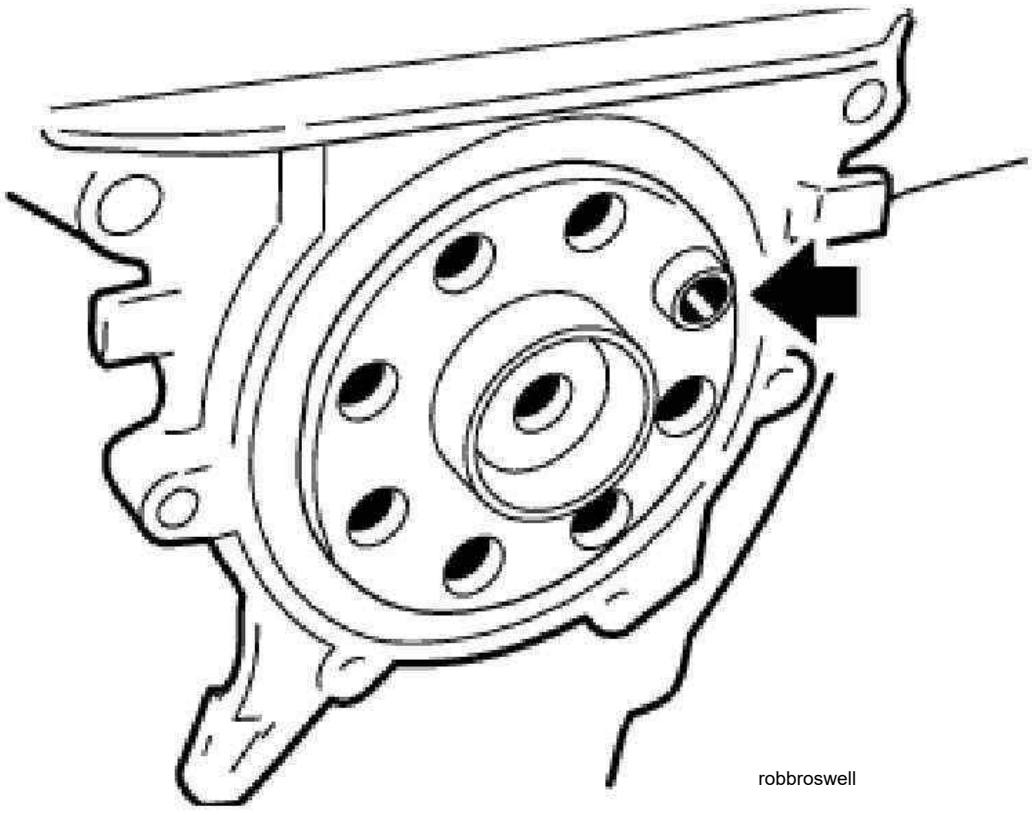


Fig. 103: Checking Dowel Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Position of dowel sleeve (1) in dual-mass flywheel is identified by two notches next to associated bolt hole.

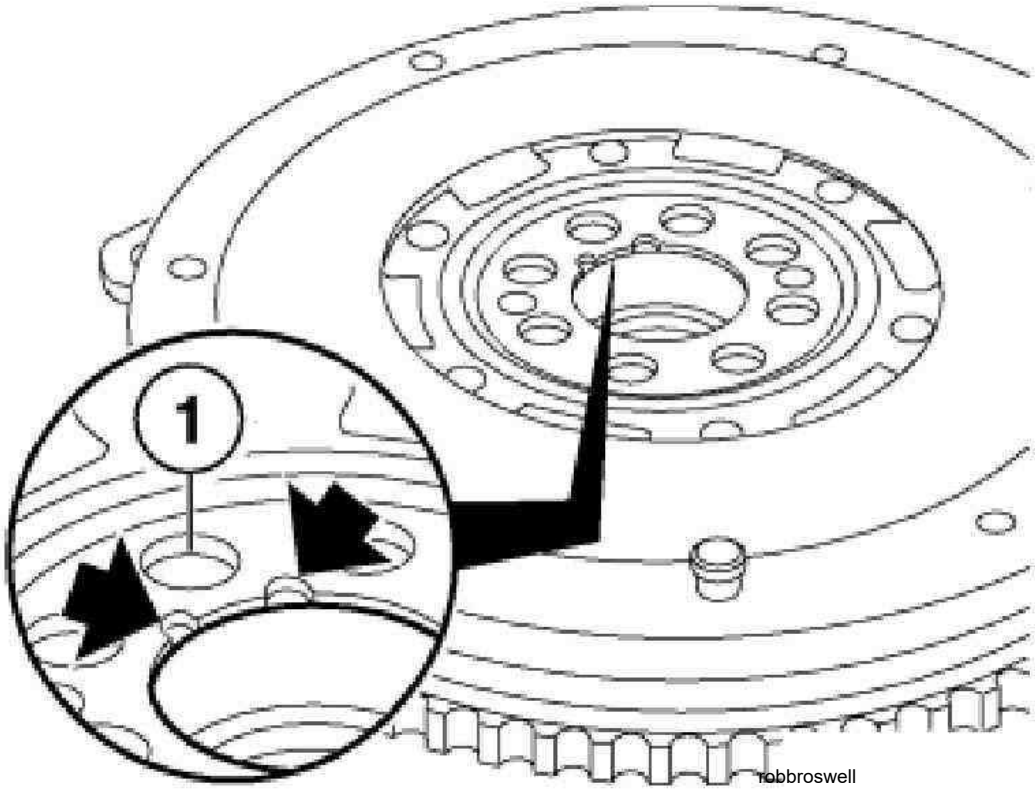


Fig. 104: Positioning Of Dowel Sleeve In Dual-Mass Flywheel
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Clean thread and install new micro-encapsulated screws.

Tightening torque, see 11 22 1AZ in **ENGINE - TIGHTENING TORQUES** .

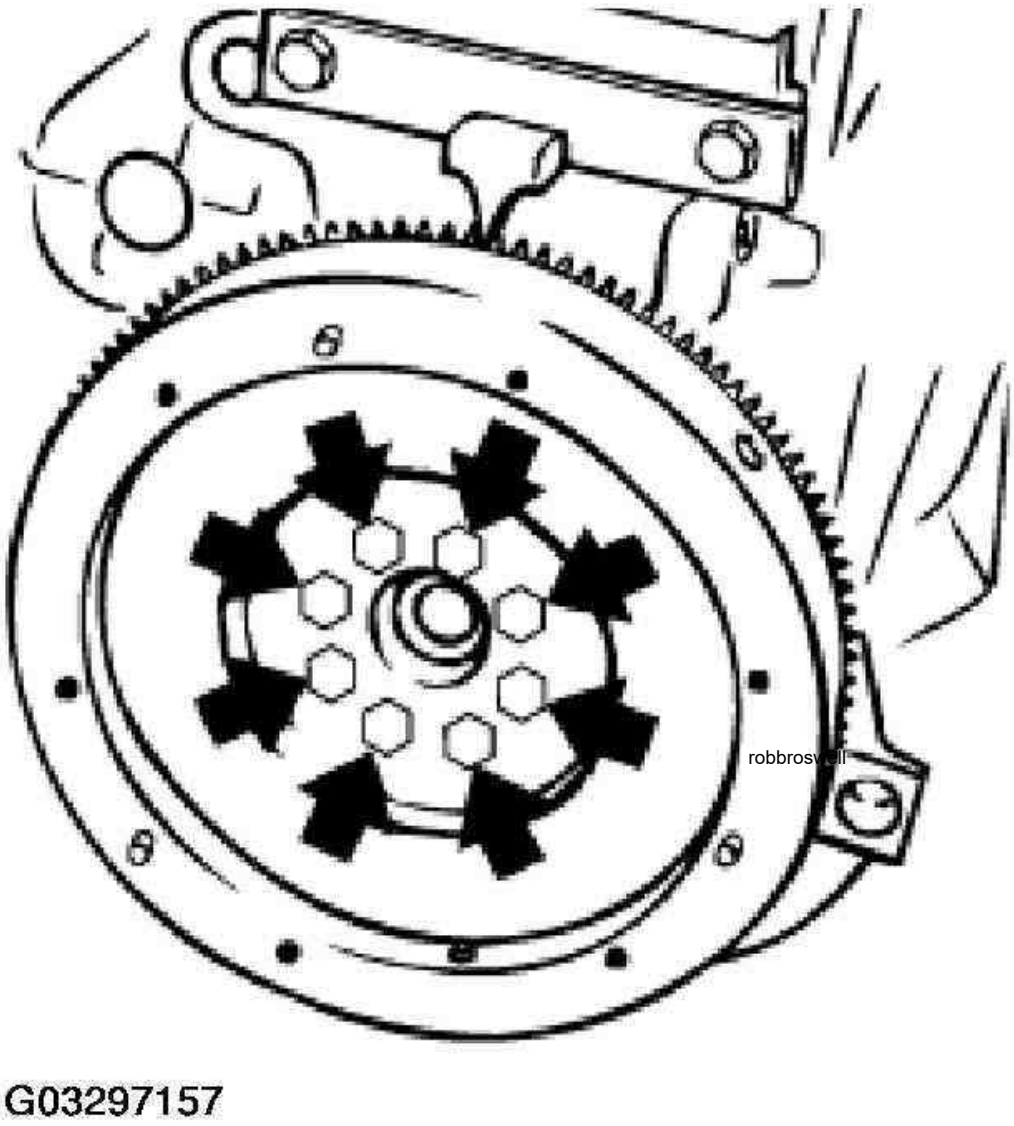


Fig. 105: Installing New Micro-Encapsulated Screws
Courtesy of BMW OF NORTH AMERICA, INC.

11 22 513 REPLACING ROLLER BEARING FOR DUAL-MASS FLYWHEEL

Special tools required:

- 21 2 051
- 21 2 052

NOTE: Flywheel removed!

Using hydraulic press (1) and special tool 21 2 051, press out dual-mass flywheel downwards on engine side.

IMPORTANT: Risk of damage:
Roller bearing must not be driven out.

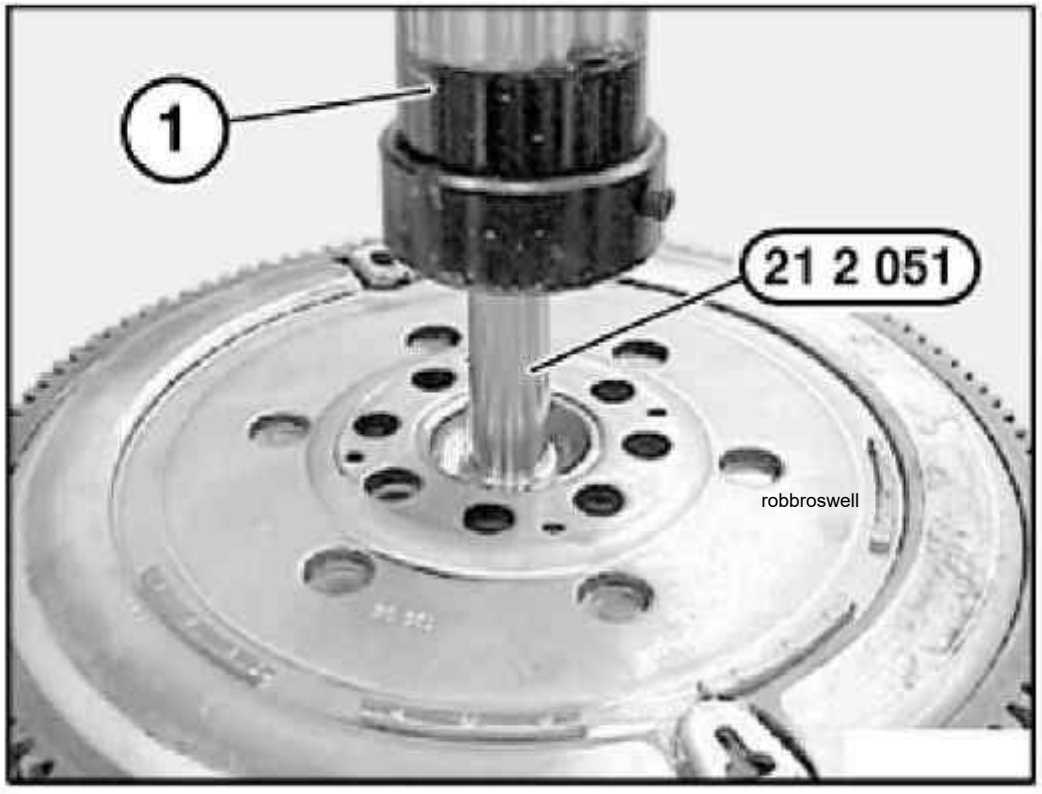


Fig. 106: Pressing Out Dual-Mass Flywheel Downwards On Engine Side
Courtesy of BMW OF NORTH AMERICA, INC.

Push roller bearing (2) onto special tool 21 2 052.

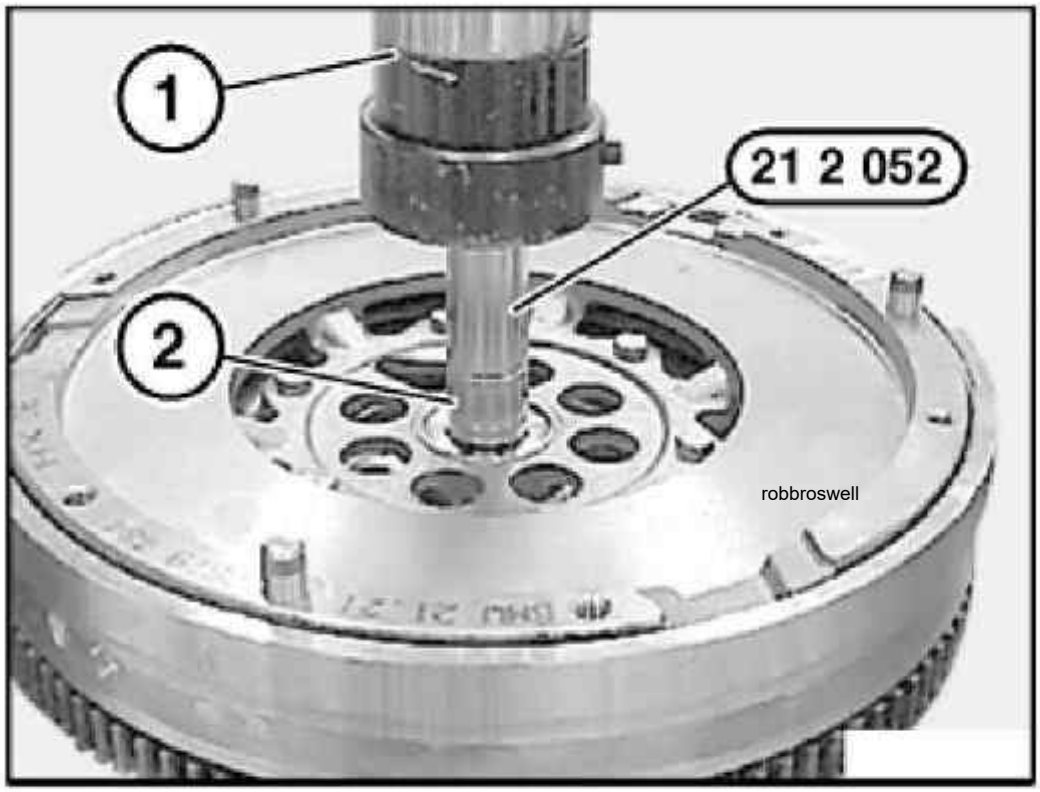
Using hydraulic press (1), press roller bearing into dual-mass flywheel as far as it will go on clutch side.

IMPORTANT: Risk of damage:
Observe press-in instruction:

- **Roller bearing must not be driven in.**
- **Roller bearing mounting force/travel monitored:**

  Min. 2000N 1 mm before end of pressing in.

  Max. 15000N during entire press-in procedure.



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Fig. 107: Pushing Roller Bearing Onto Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

VIBRATION DAMPER

11 23 010 REMOVING AND INSTALLING OR REPLACING VIBRATION DAMPER (M52TU / M54 / M56)

Special tools required:

- 11 8 190
- 11 8 200
- 11 8 210

Necessary preliminary tasks:

- Unscrew and remove splash guard.
- E83/E85/E60: Remove fan cowl with electric fan . See **FAN COWL** .
- Remove A/C compressor drive belt . See **A/C COMPRESSOR DRIVE BELT** .
- Remove alternator drive belt . See **GENERATOR DRIVE BELT** .

IMPORTANT: Risk of damage.
Protect cooler against damage.

Version 1

Vibration damper and hub for vibration damper are two parts:

Unscrew vibration damper bolts and take off vibration damper.

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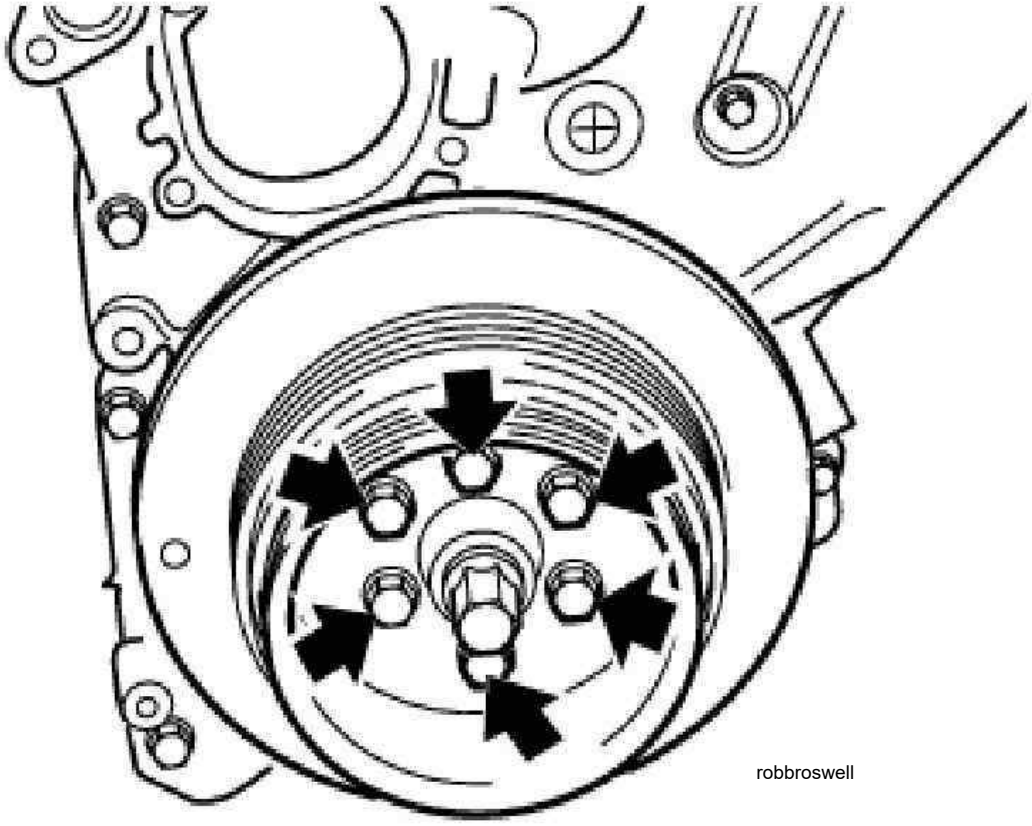


Fig. 108: Identifying Vibration Damper And Hub
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

Vibration damper and hub for vibration damper are two parts:

Installation:

Align locating bore in vibration damper to dowel pin.

Install and tighten down screws.

Tightening torque, see 11 23 3AZ in **ENGINE - TIGHTENING TORQUES** .

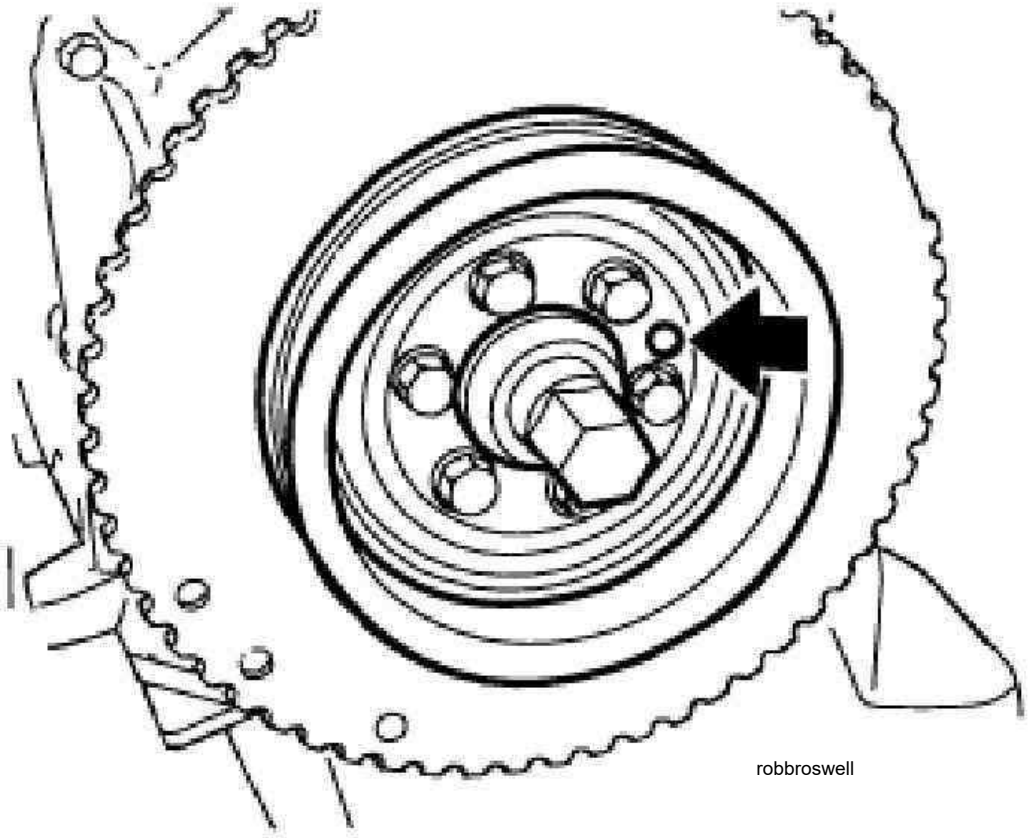


Fig. 109: Aligning Locating Bore In Vibration Damper To Dowel Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Vibration damper and hub for vibration damper are one part:

Screw special tool 11 8 190 to special tool 11 8 200.

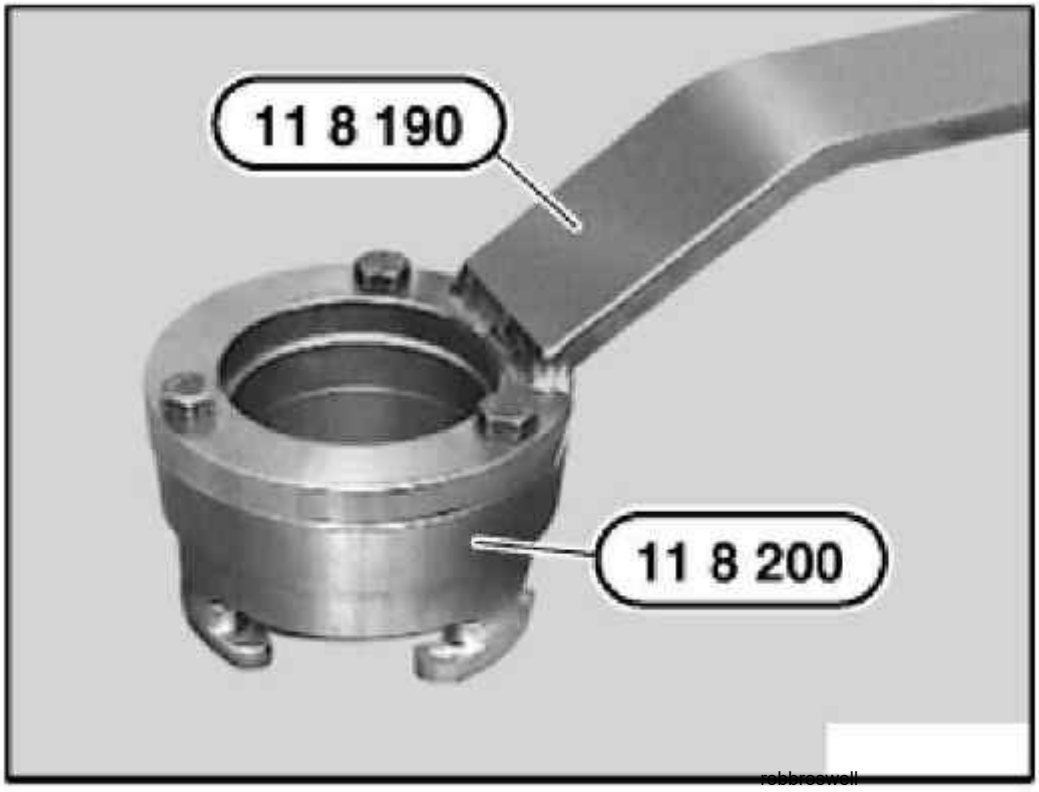
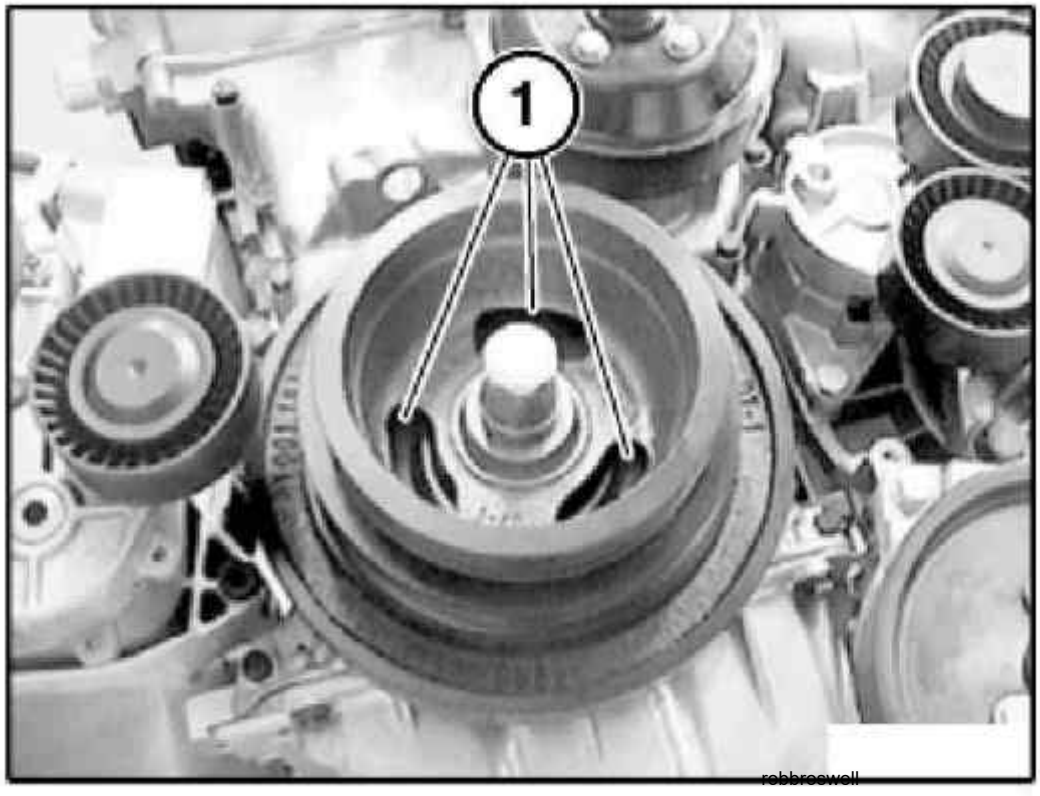


Fig. 110: Identifying Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

NOTE: Special tool 11 8 200 must snap into place in openings (1).



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Fig. 111: Installing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

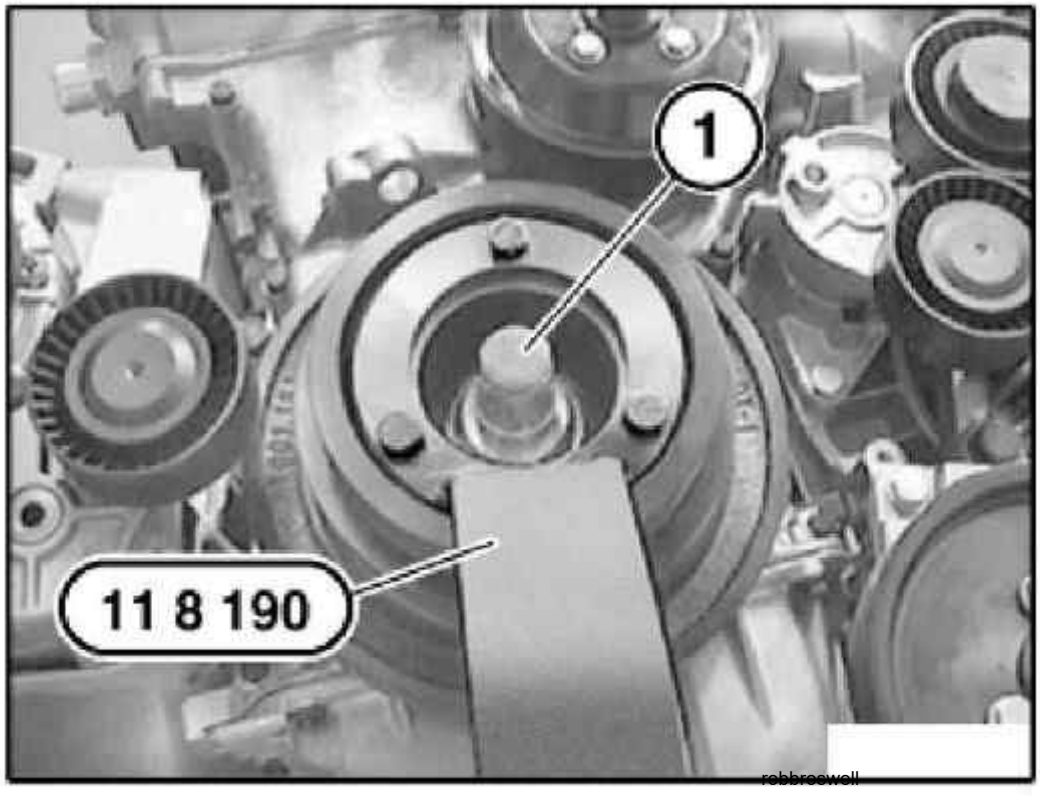
Version 2

When releasing and tightening down central bolt, grip special tool 11 8 190 with assistance of a second person.

Version 2

Insert special tool 11 8 200 in openings on vibration damper and turn counterclockwise so that counter-supports snap into place on vibration damper.

Release central screw (1).



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Fig. 112: Inserting Special Tool In Openings On Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Feed out special tools 11 8 190 / 11 8 200.

Remove central screw and washer.

Carefully detach vibration damper (1) by hand.

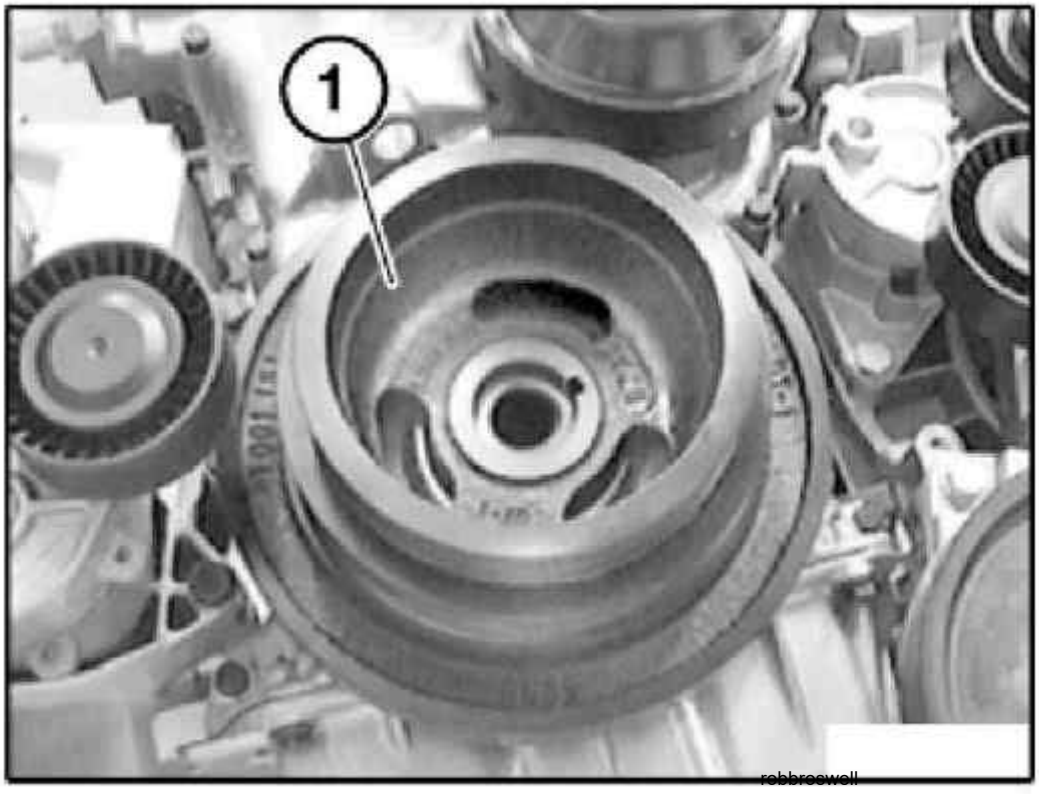


Fig. 113: Detaching Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

NOTE: If vibration damper cannot be detach by hand:

Insert special tool 11 8 200 in openings on vibration damper and turn clockwise so that counter-supports snap into place on vibration damper.

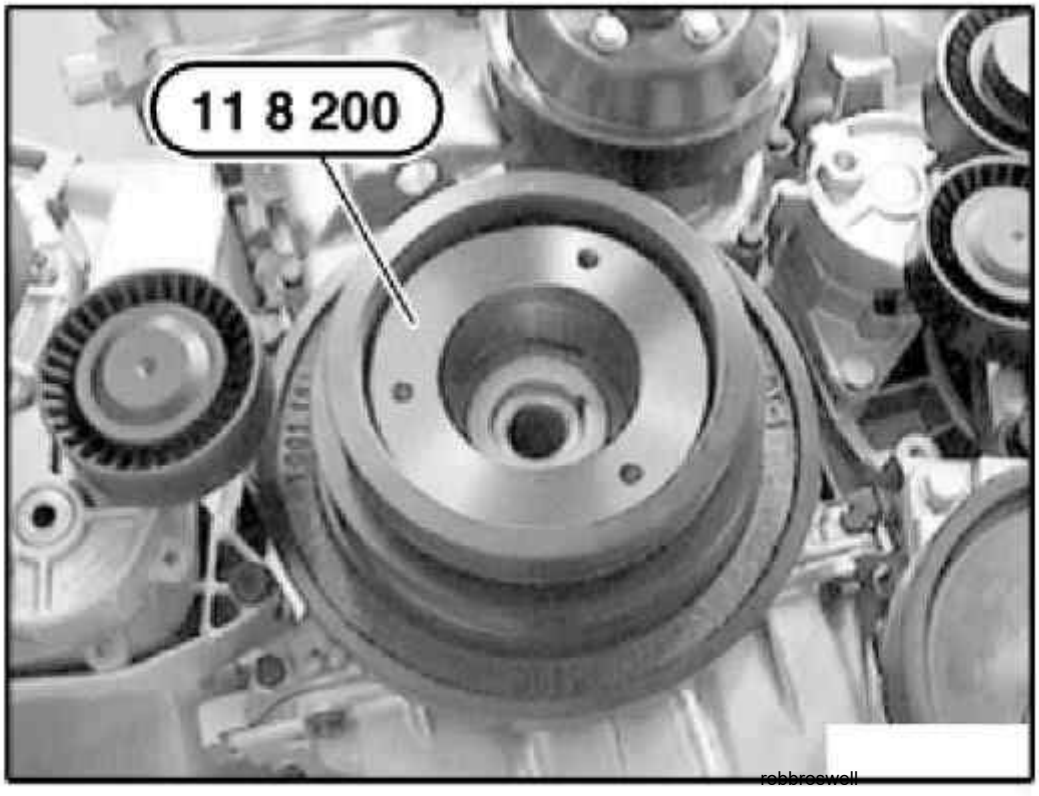


Fig. 114: Inserting Special Tool In Openings On Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Screw out spindle (1) on special tool 11 8 210 as far as possible.

Z3 only:

Screw in spindle (1) on special tool 11 8 210 approx. 15 mm and screw out again only after installation between special tool 11 8 200 and cooler.

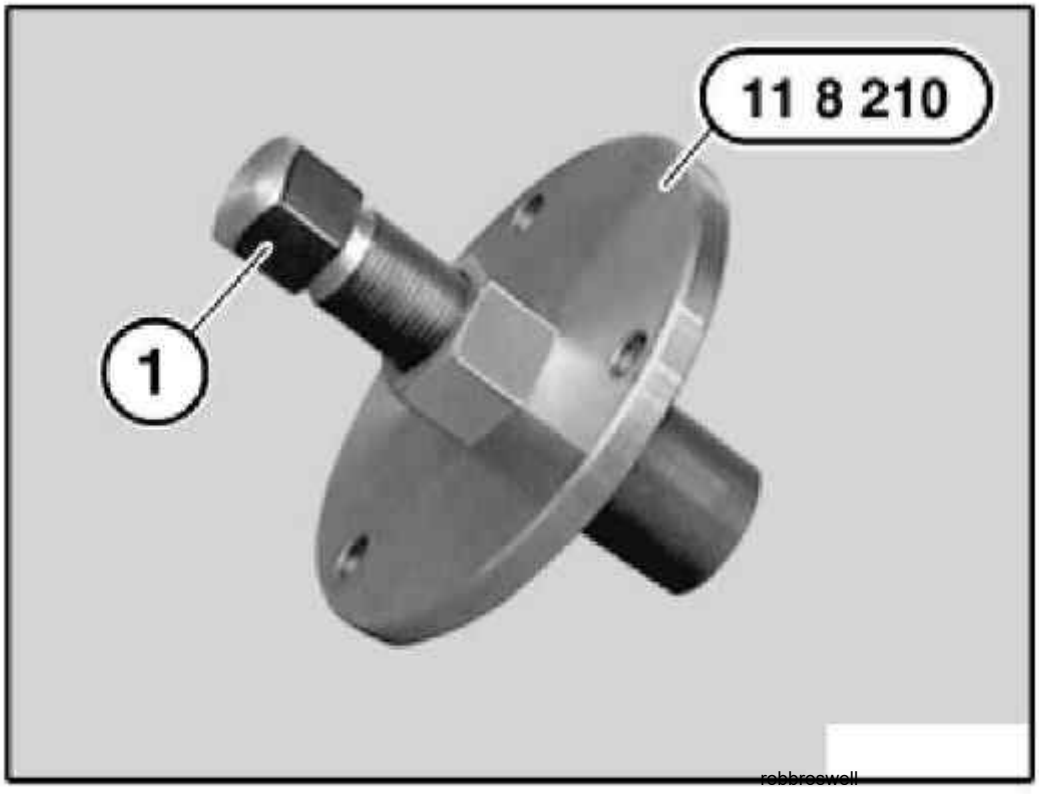


Fig. 115: Identifying Screw In Spindle On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

IMPORTANT: Risk of damage.
Protect cooler against damage.
Carefully install special tool 11 8 210.

Screw special tool 11 8 210 to special tool 11 8 200.

Detach vibration damper by turning spindle (1) on special tool 11 8 210.

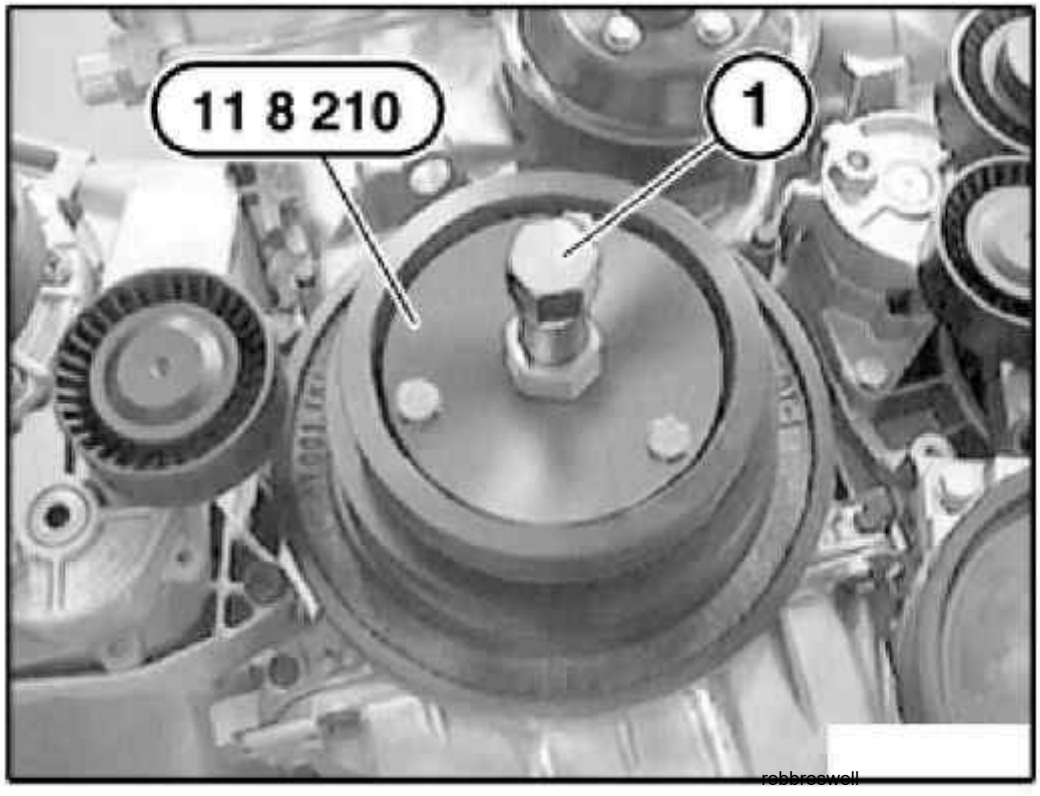


Fig. 116: Detaching Vibration Damper By Turning Spindle On Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Installation:

Check featherkey (1) for damage and correct installation position.

Replace radial seal in lower timing case cover . See **11 14 141 Replacing Radial Seal In Lower Timing Case Cover**.

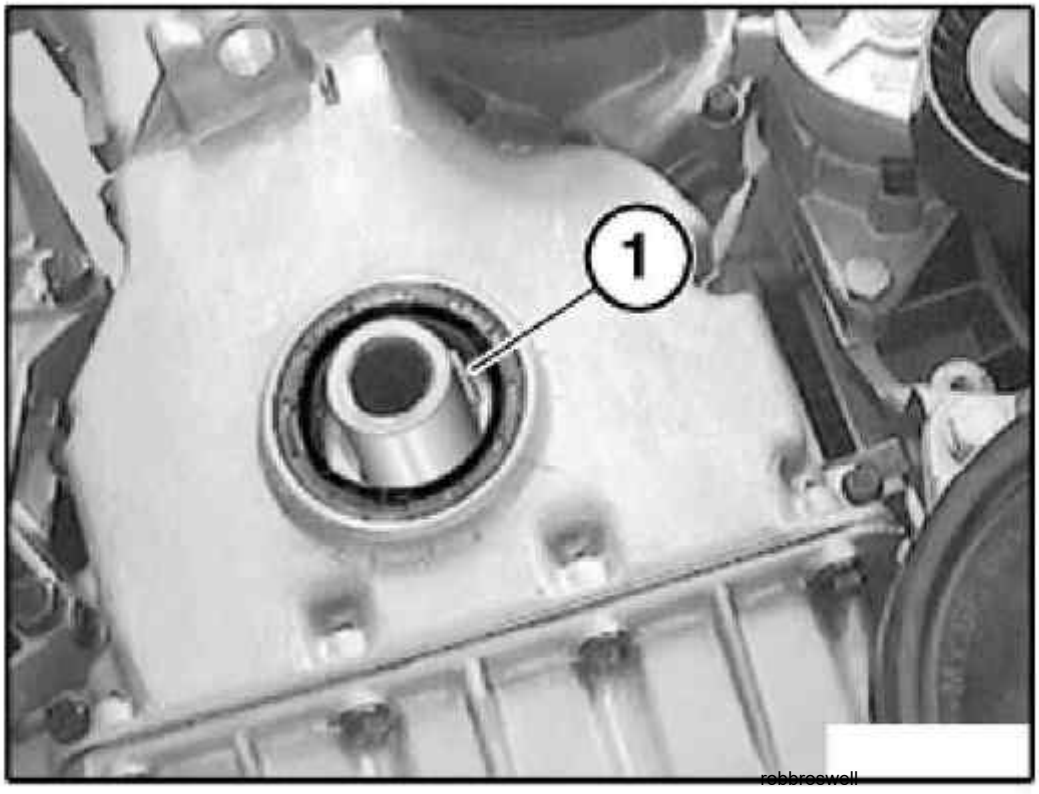


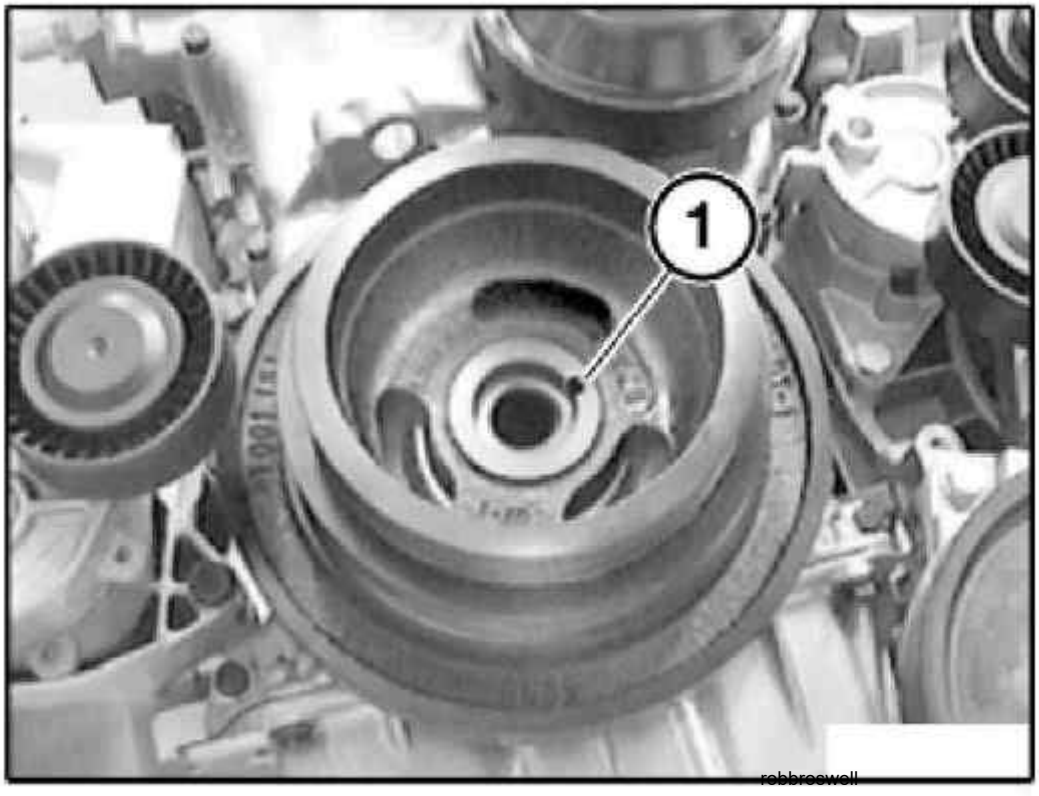
Fig. 117: Checking Featherkey
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Installation:

Align groove (1) in vibration damper to featherkey.

Fit vibration damper.



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Fig. 118: Aligning Groove In Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Installation:

Replace central screw (1).

Install central screw and washer.

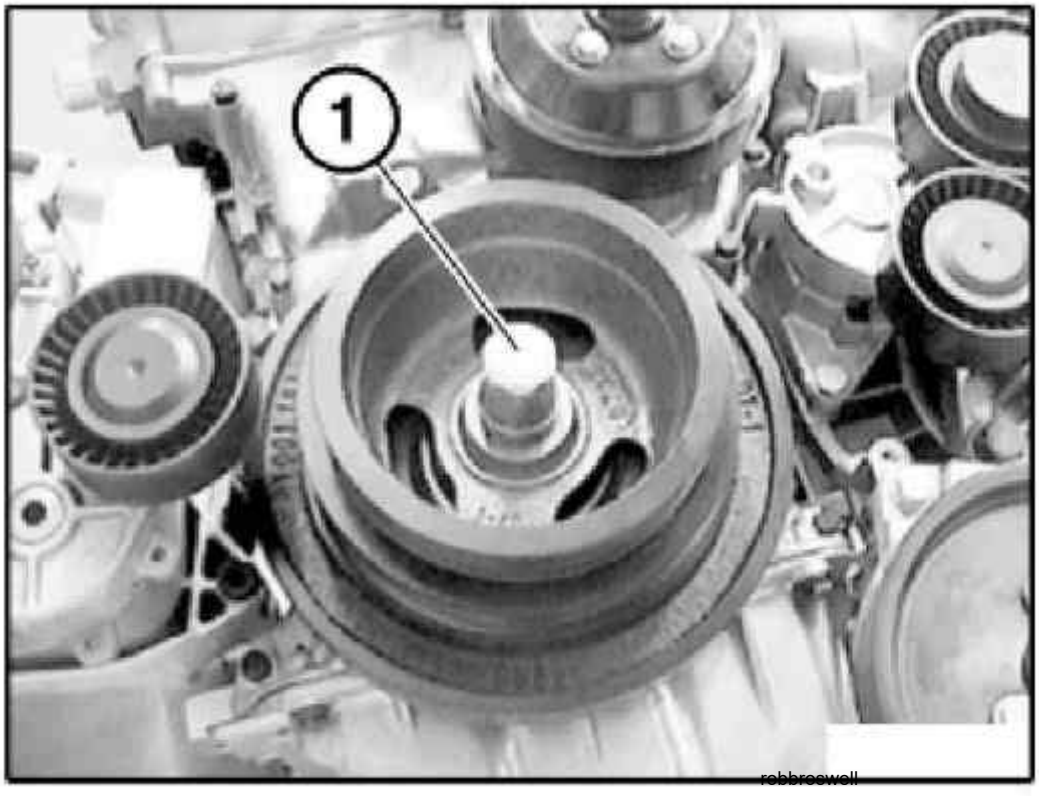


Fig. 119: Replacing Central Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Installation:

Screw special tool 11 8 190 to special tool 11 8 200.

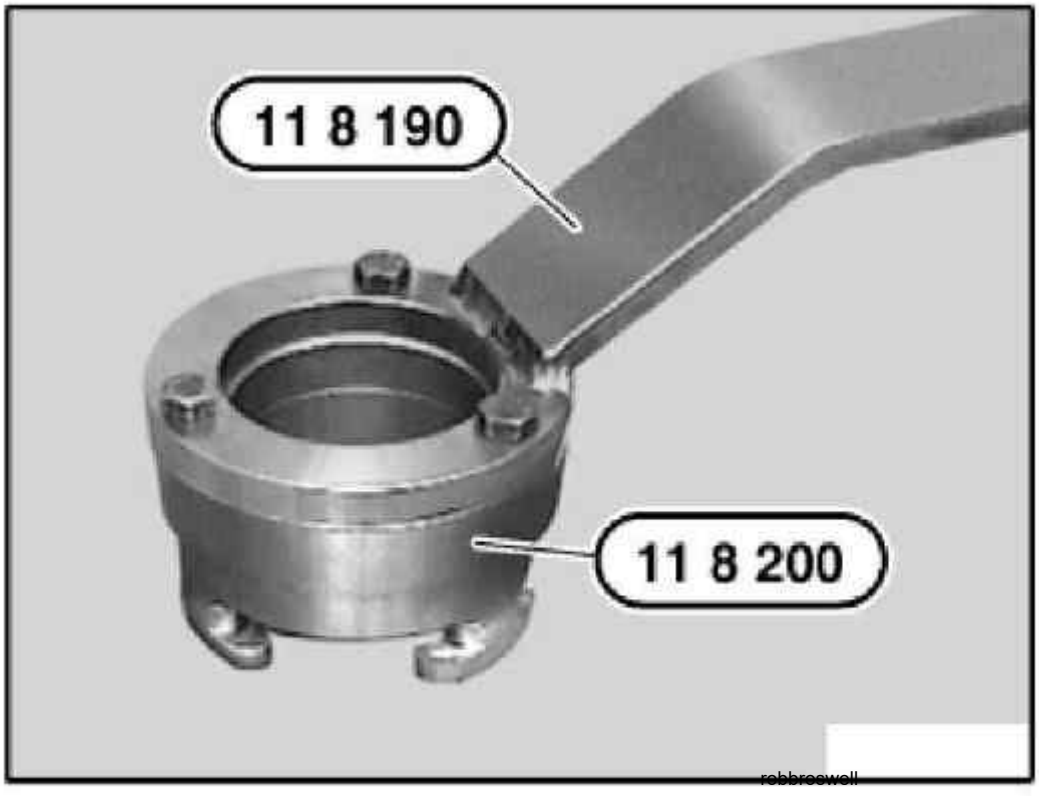


Fig. 120: Installing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Insert special tool 11 8 200 in openings on vibration damper and turn clockwise so that counter-supports snap into place on vibration damper.

Tighten down central screw (1).

Tightening torque, see 11 23 2AZ in **ENGINE - TIGHTENING TORQUES** .

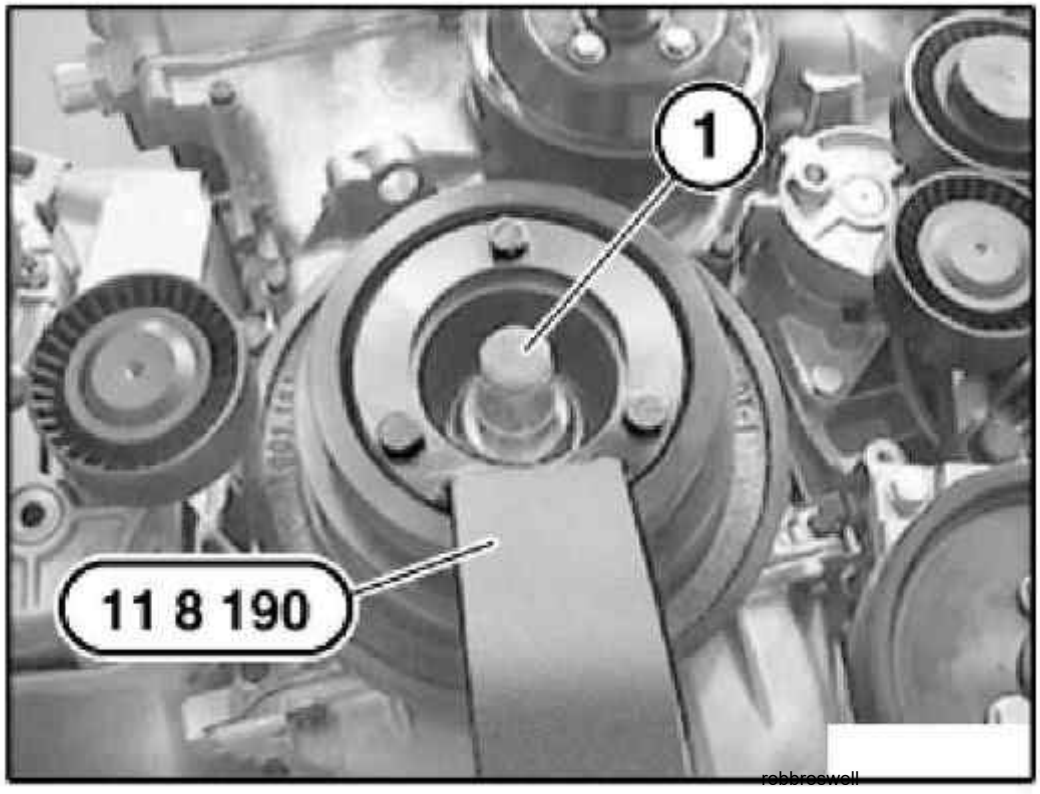


Fig. 121: Inserting Special Tool In Openings On Vibration Damper
Courtesy of BMW OF NORTH AMERICA, INC.

CONNECTING ROD WITH BEARING

11 24 571 REPLACING ALL CONNECTING ROD BEARINGS (M52 / S52 / M52TU / M54 / M56)

Special tools required:

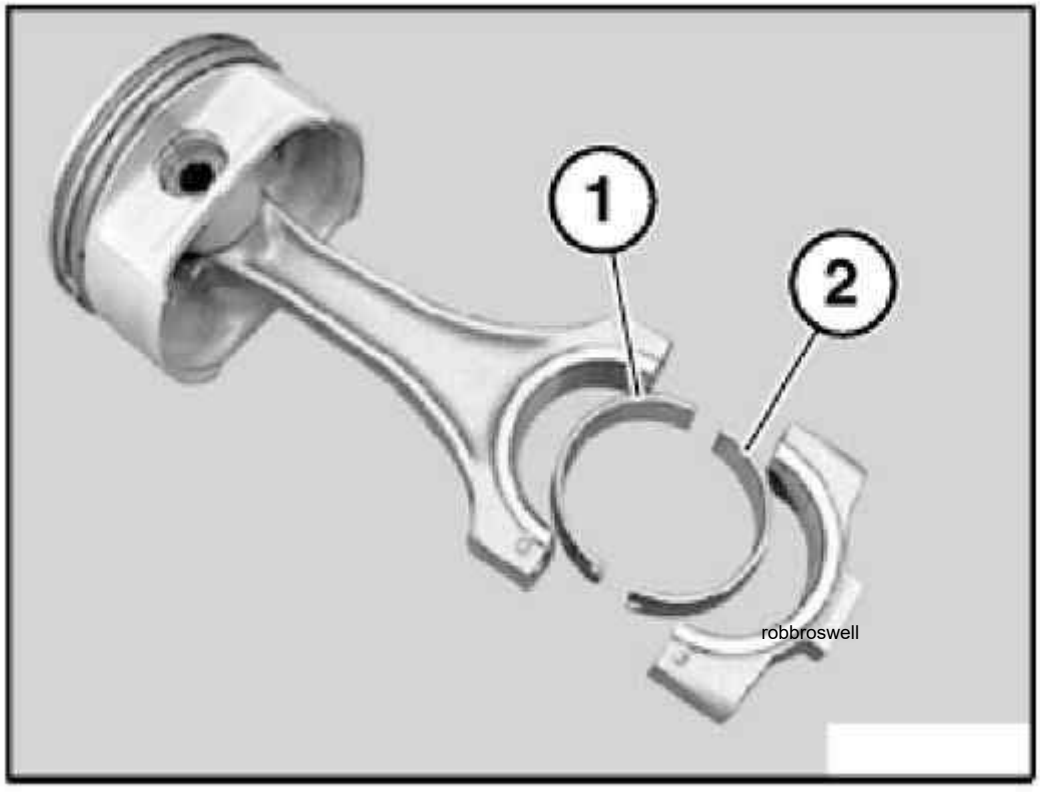
- 00 2 590
- 00 9 120
- 11 2 110

(piston removed)

IMPORTANT: Note grinding stages on crankshaft.

Install new conrod bearing shells.

Insert one blue (1) and one red (2) bearing shell (irrespective of the color coding on the conrod shaft).



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Fig. 122: Inserting Bearing Shell
Courtesy of BMW OF NORTH AMERICA, INC.

Install piston . See **11 25 530 Removing And Installing Or Replacing All Pistons (M52 / S52 / M52TU / M54 / M56)**.

Check conrod bearing clearance.

Piston in BDC position.

Fit special tool 00 2 590 (Plastigage Type PG 1) to oil-free crankshaft.

Fit bearing caps so that pair numbers match up.

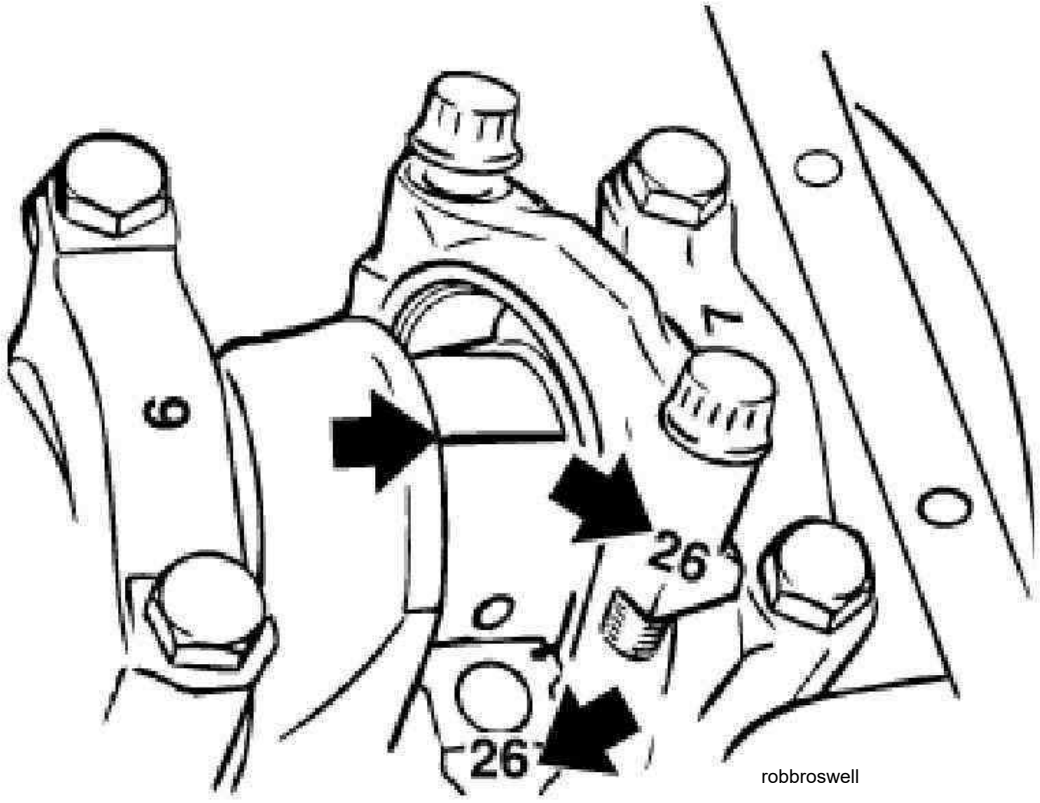


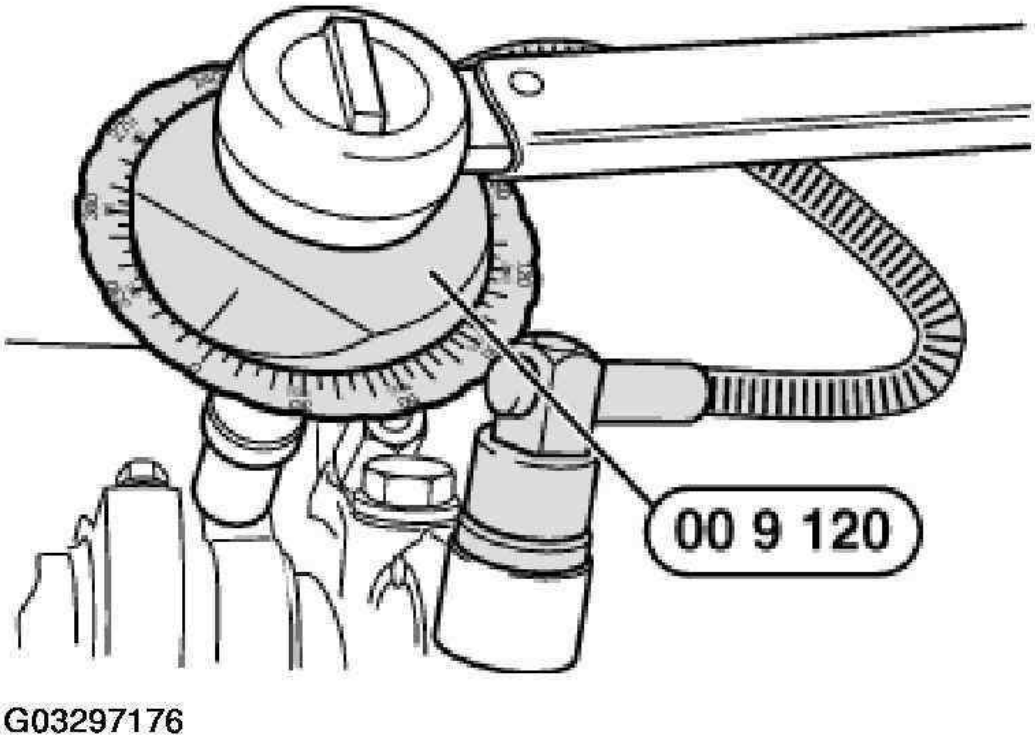
Fig. 123: Checking Conrod Bearing Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not distort conrods or crankshaft.

Use the old conrod bolts to check conrod clearance.

Tighten down conrod bolts with special tool 00 9 120 or with special tool 11 2 110.

Tightening torque, see 11 24 1AZ in **ENGINE - TIGHTENING TORQUES** .



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Fig. 124: Tightening Down Conrod Bolts With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Remove bearing cap and read off bearing play at width of flattened plastic thread with assistance of measurement scale.

Conrod bearing clearance .

- Remove plastic thread.
- Coat crankshaft and bearing shells with oil.
- Install new conrod bolts and tighten down.

Tightening torque, see 11 24 1AZ in **ENGINE - TIGHTENING TORQUES** .

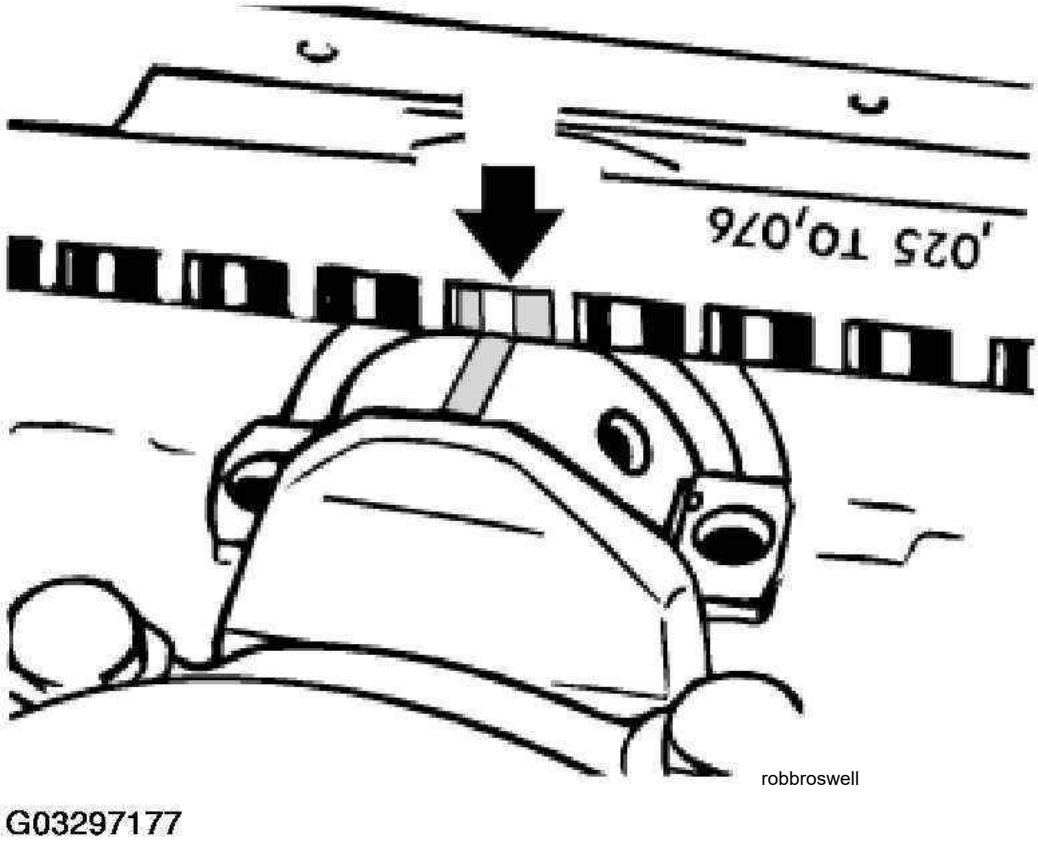


Fig. 125: Removing Plastic Thread
Courtesy of BMW OF NORTH AMERICA, INC.

PISTON WITH RINGS AND PIN

11 25 530 REMOVING AND INSTALLING OR REPLACING ALL PISTONS (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 00 9 120
- 11 2 110
- 11 2 260
- 11 2 470
- 11 3 480
- 11 8 141

(engine removed)

Remove cylinder head.

Removal:

Removal of pistons is described separately from installation.

Assembly sequence for removal and installation is different.

IMPORTANT: Re-install piston, connecting rod and bearing shells back in the same position and in the same installation location.
Connecting rods and bearing covers are designated with the same pair number: do not mix them.

Remove oil pump . See **11 41 000 Removing And Installing/Replacing Oil Pump (M52TU / M54 / M56)**.

If oil pump and oil scraper are two parts:

Remove oil scraper.

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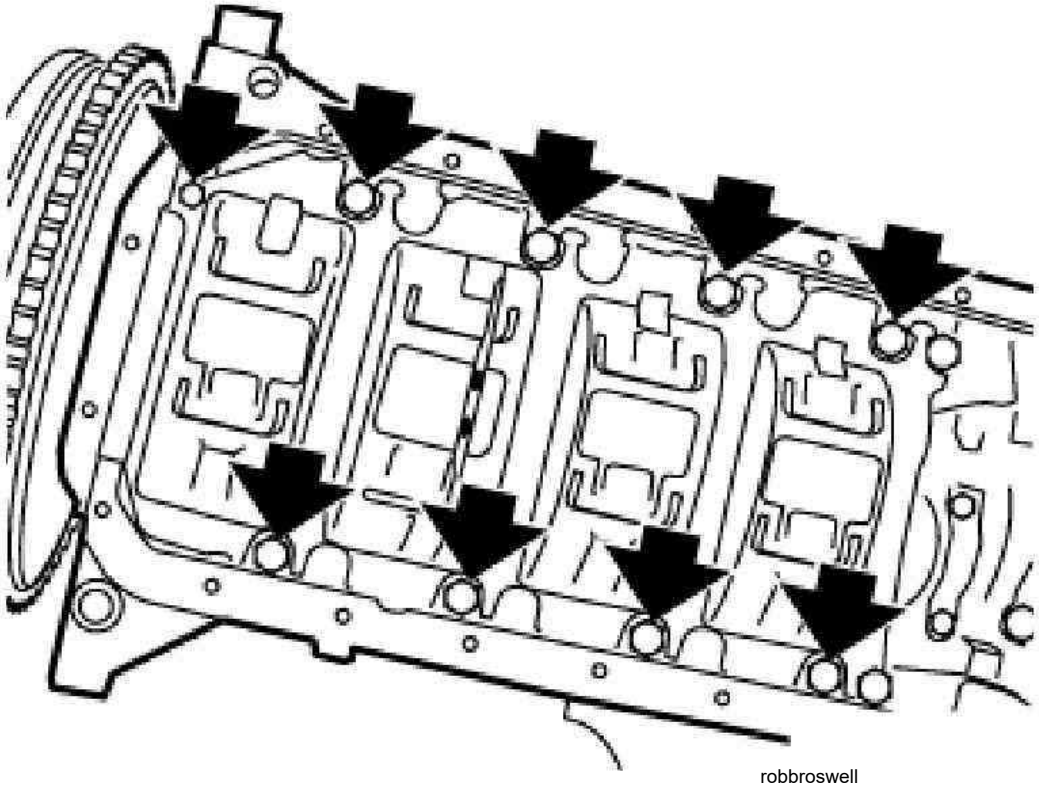


Fig. 126: Removing Oil Scraper
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Figure shows crankshaft removed.

On engines with spray nozzles for piston cooling on cylinder underside:

IMPORTANT: When removing and installing pistons, make sure the piston cooling spray nozzles are not damaged.

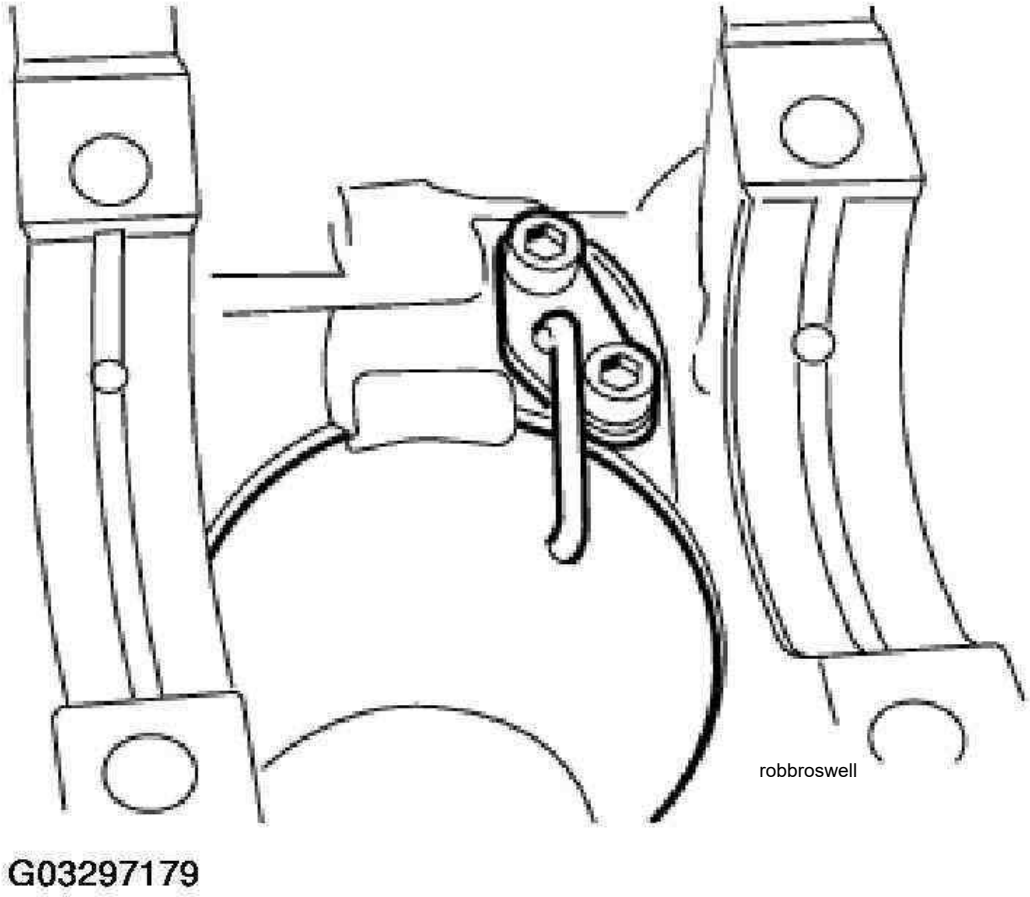


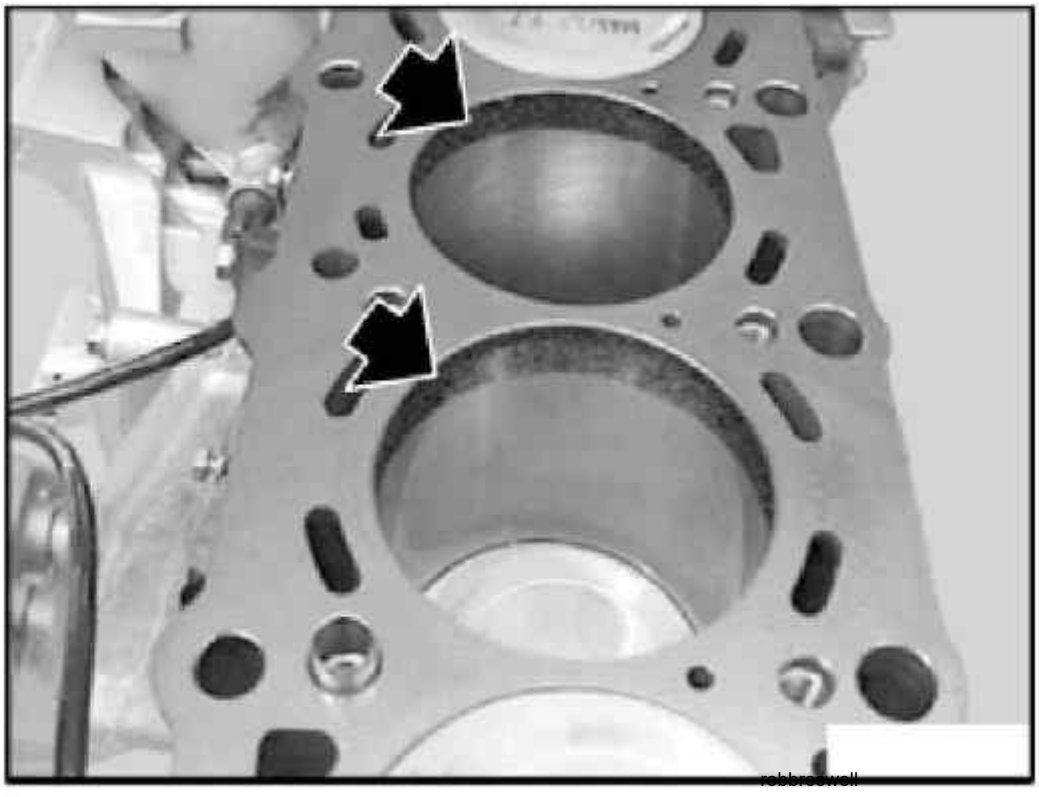
Fig. 127: Identifying Spray Nozzles For Piston Cooling On Cylinder Underside
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Screw threads are coated with screw securing adhesive (Loctite). Replace screws.

In event of heavy oil carbon residue:

Carefully remove oil carbon residue from cylinder wall.



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Fig. 128: Removing Oil Carbon Residue From Cylinder Wall
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew conrod bearing cover.

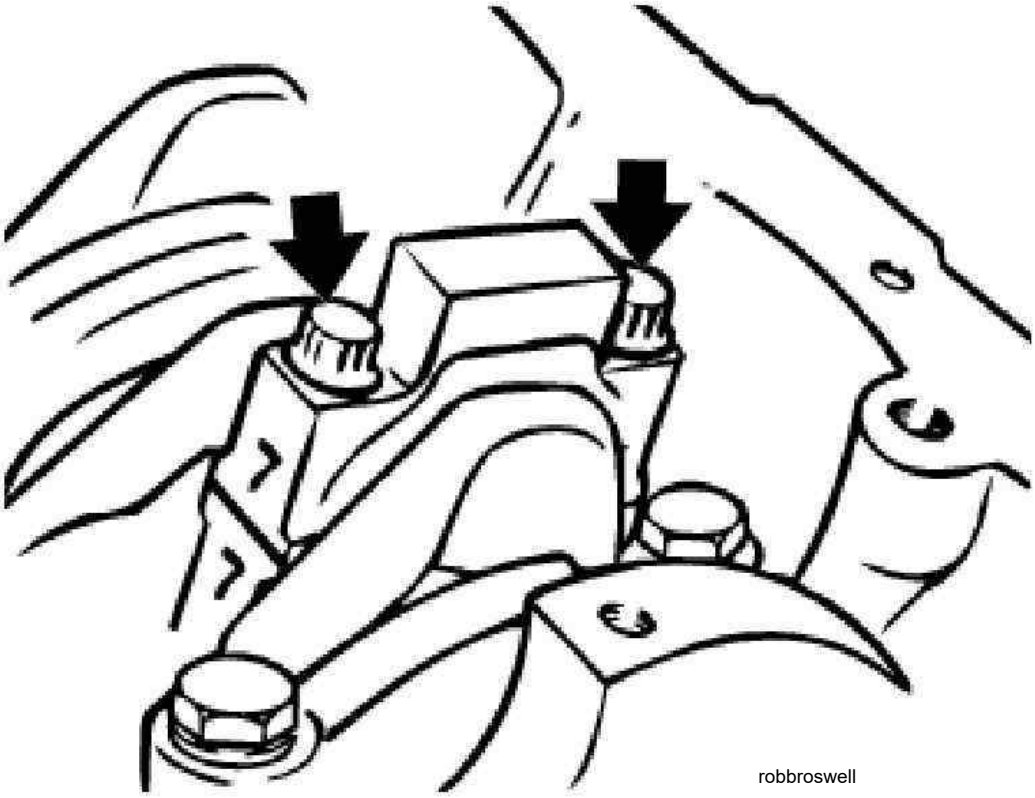


Fig. 129: Removing Conrod Bearing Cover Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 3 480 in conrod.

Remove conrod with piston from cylinder head side.

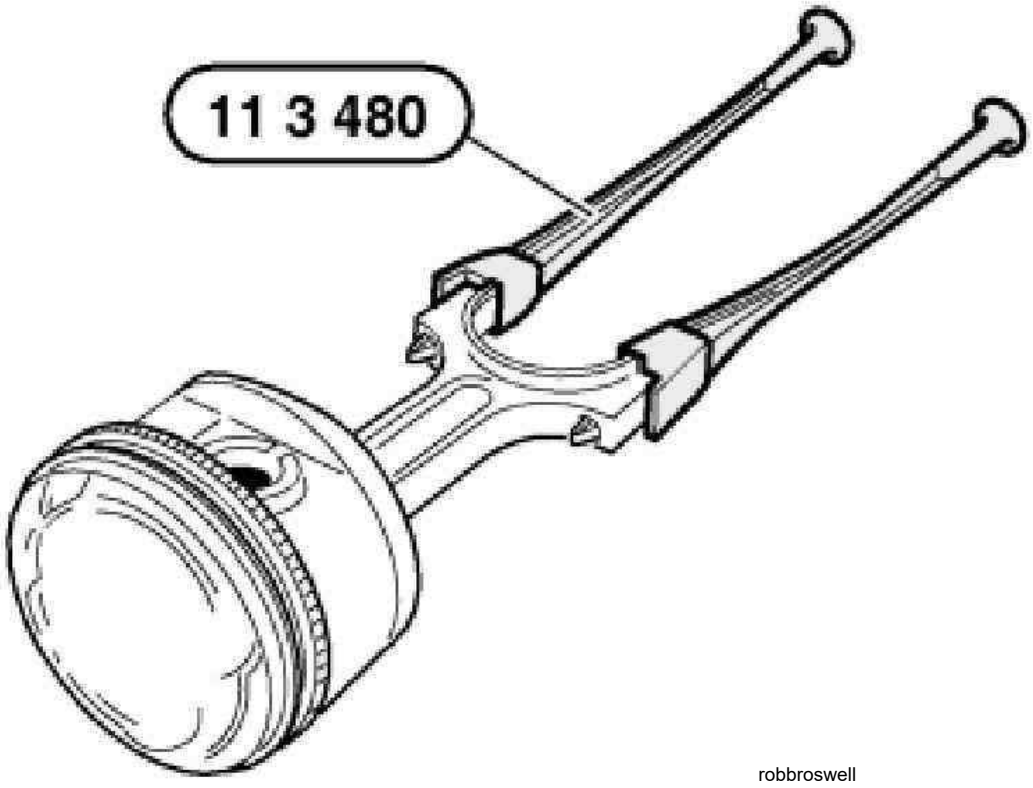
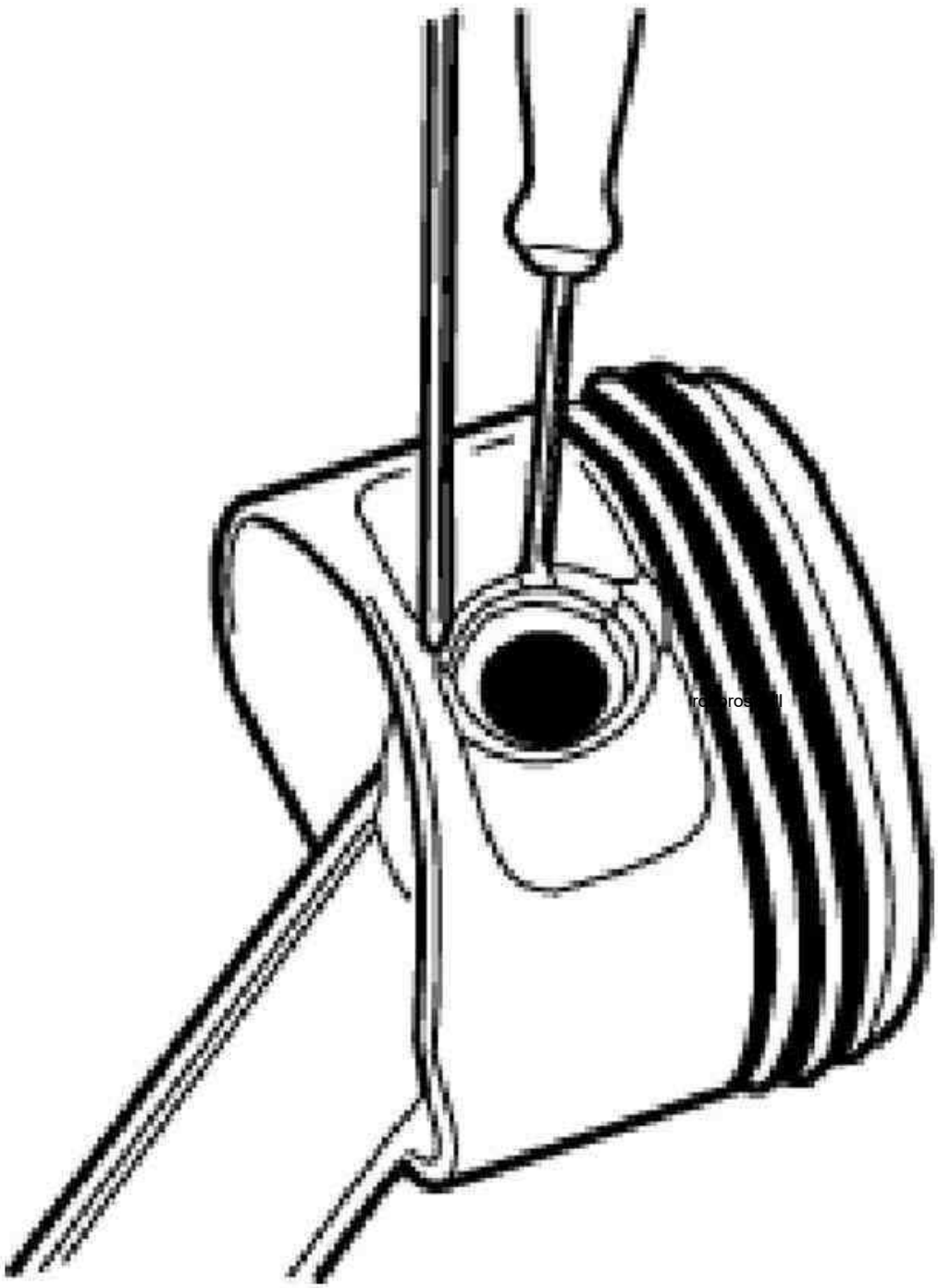


Fig. 130: Inserting Special Tool In Conrod
Courtesy of BMW OF NORTH AMERICA, INC.

Lift out retaining ring and press out piston pin.

IMPORTANT: Piston and piston pin are paired and must not be fitted individually.



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Fig. 131: Removing Retaining Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Installation of pistons is described separately from removal. The assembly sequence differs between removal and installation.

The piston pin must be able to be pressed through the liner by hand with little force and must not display any significant play.

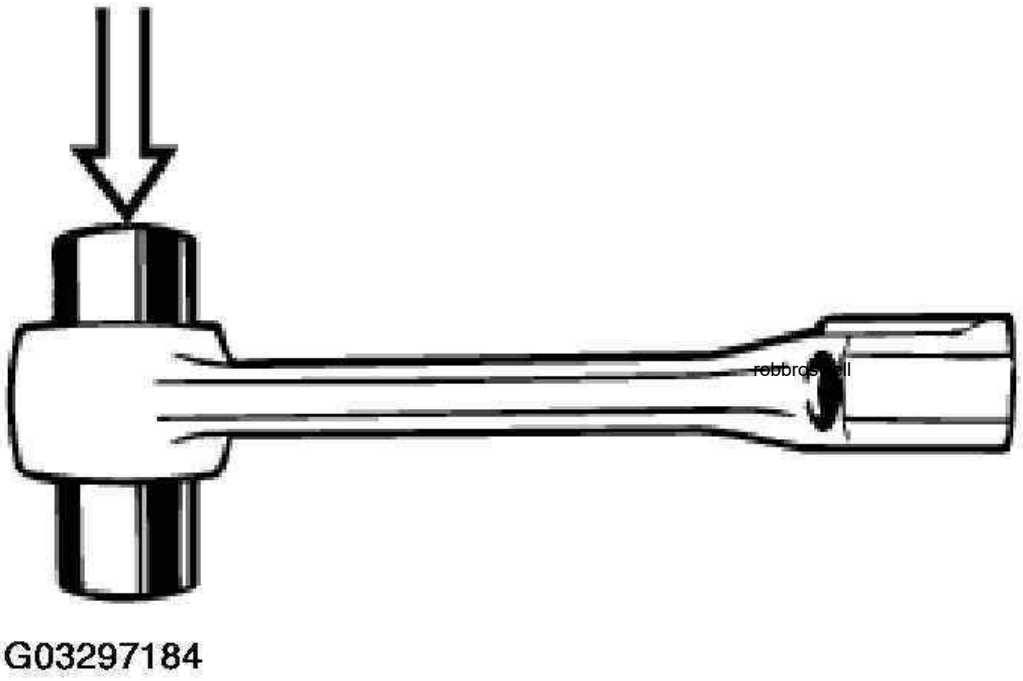


Fig. 132: Installing Piston Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Measure piston installation clearance:

Measure piston diameter with micrometer at distance A from the underside of the piston and at offset angle of 90° to piston pin axis.

Measurement A .

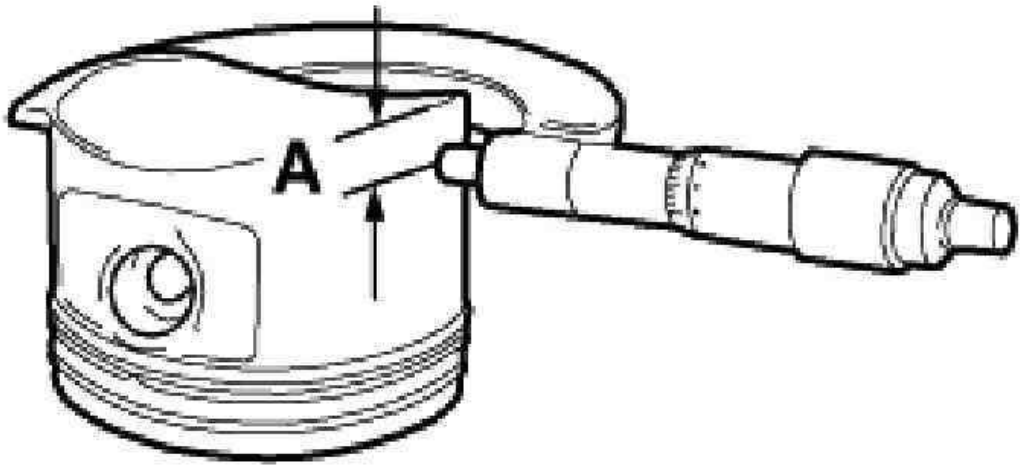


Fig. 133: Measuring Piston Diameter With Micrometer
Courtesy of BMW OF NORTH AMERICA, INC.

Adjust micrometer to cylinder bore of engine block, set internal caliper on micrometer to zero. Measure bottom, center and top of cylinder bore in direction of travel and direction of engine rotation.

Diameter of cylinder bore .

Piston installation clearance .

Total permissible wear tolerance .

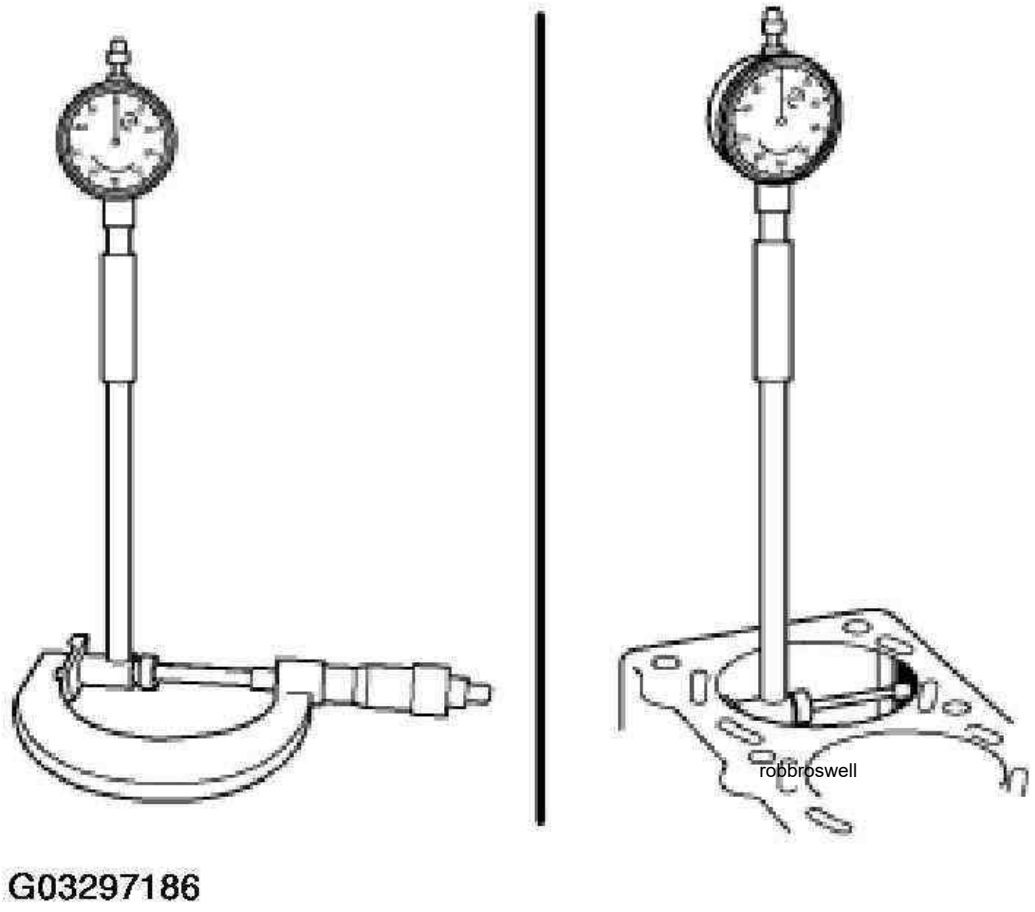
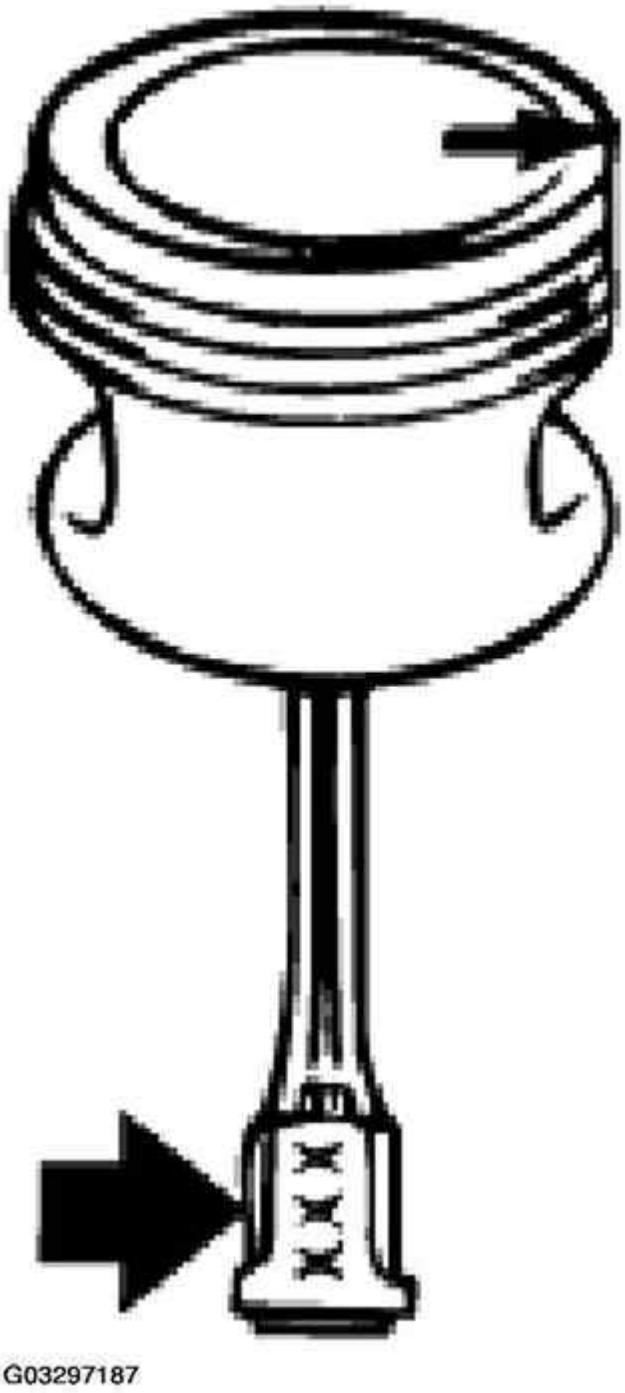


Fig. 134: Measuring Cylinder Bore Of Engine Block
Courtesy of BMW OF NORTH AMERICA, INC.

Replace conrod bearing shells . See **11 24 571 Replacing All Connecting Rod Bearings (M52 / S52 / M52TU / M54 / M56)**.

IMPORTANT: Piston and piston pin are paired and must not be fitted individually.

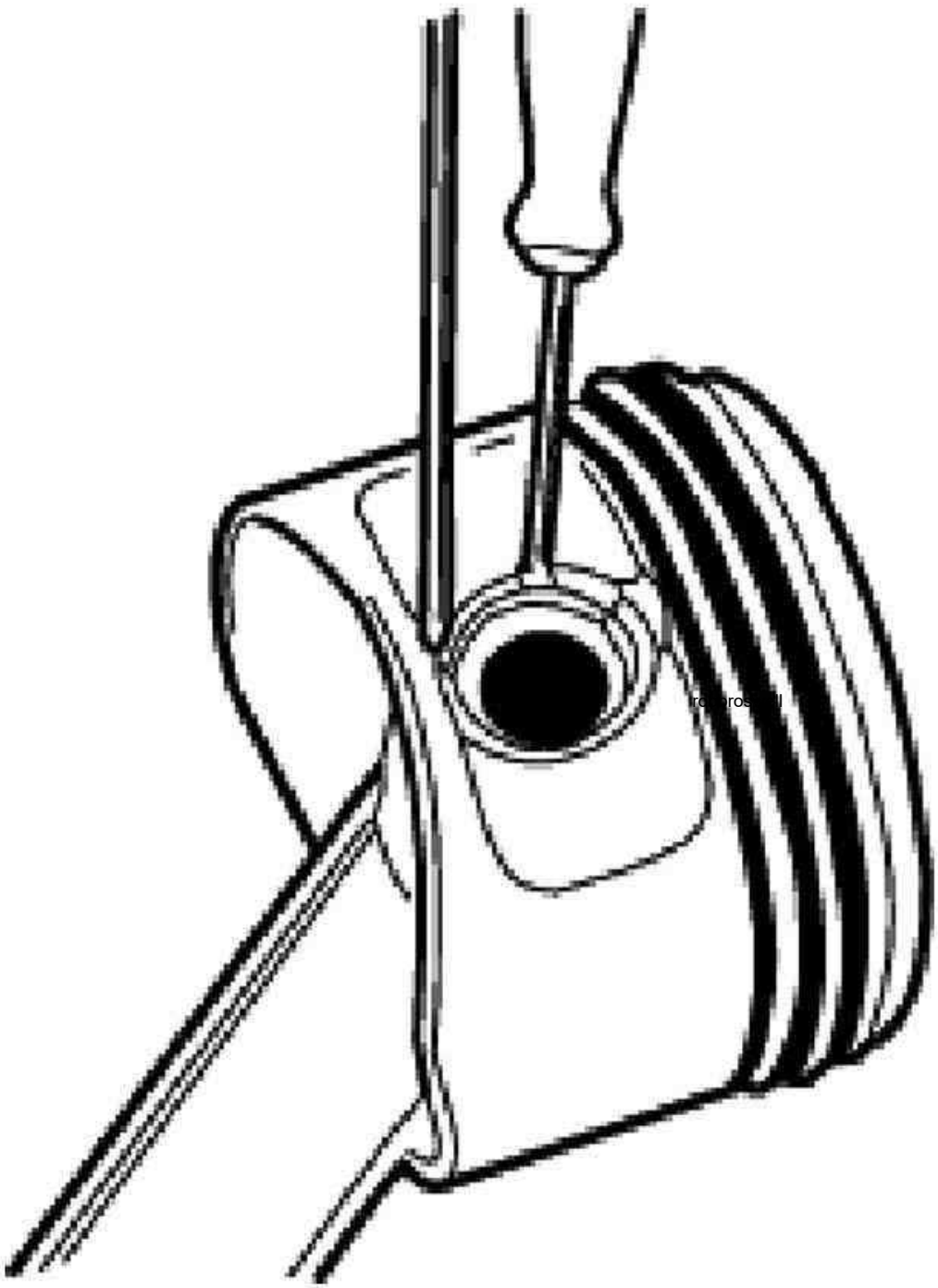
Fit conrod with piston pin to piston in such a way that both of the visible pair numbers on the installation direction arrow on the piston point to the right.



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Fig. 135: Fitting Conrod With Piston Pin To Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install snap ring so that opening is opposite recess.



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Fig. 136: Installing Snap Ring
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 2 470 in conrod.

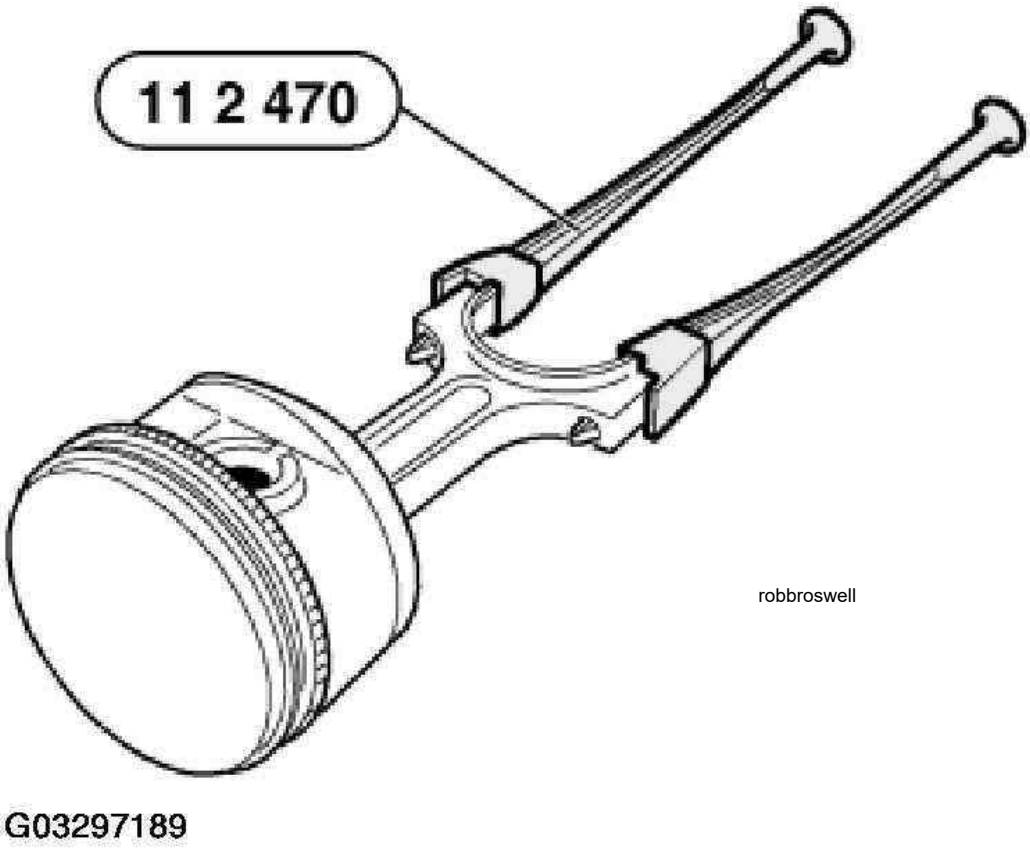
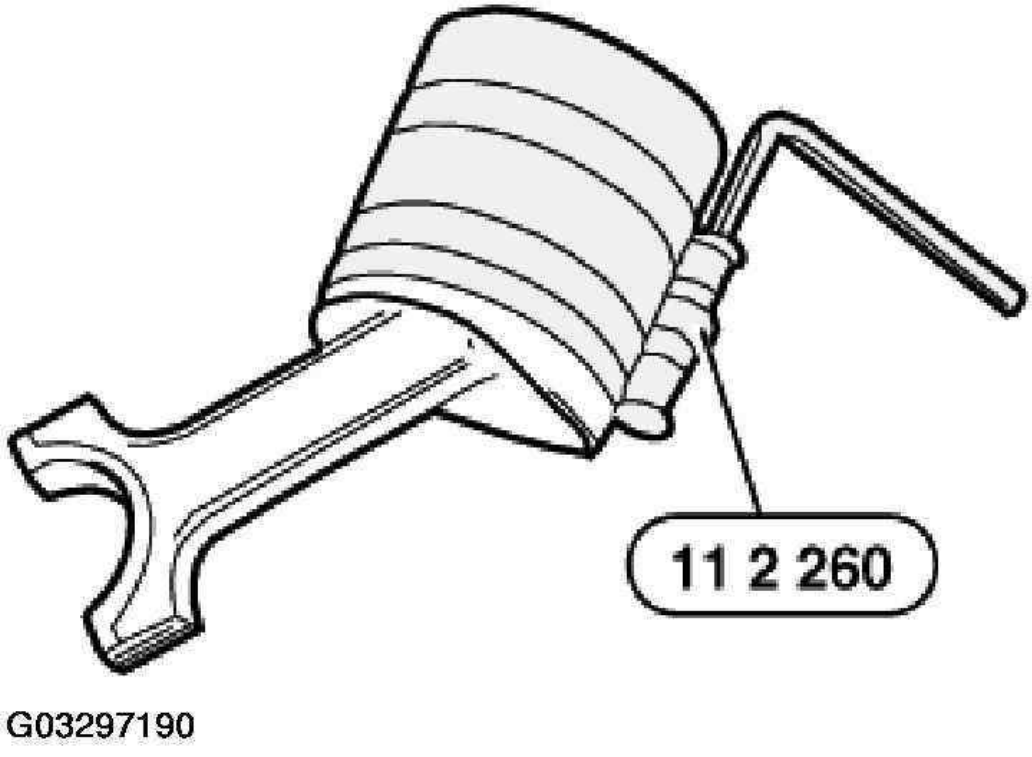


Fig. 137: Inserting Special Tool In Conrod
Courtesy of BMW OF NORTH AMERICA, INC.

Lightly coat pistons and piston rings with oil.

Align contact points on piston rings (offset at approx. 120°, but do not arrange over piston pin lug).

NOTE: Piston diameter 84 mm:
Use special tool 11 8 141.
Piston diameter 80 mm:
Press together piston rings with special tool 11 2 260.



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Fig. 138: Compressing Piston Rings With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Install piston so that arrow points to camshaft drive.

Entire circumference of tightening strap must rest firmly on engine block.

IMPORTANT: Danger of piston ring failure.

Press in piston only with finger force (do not knock in!).

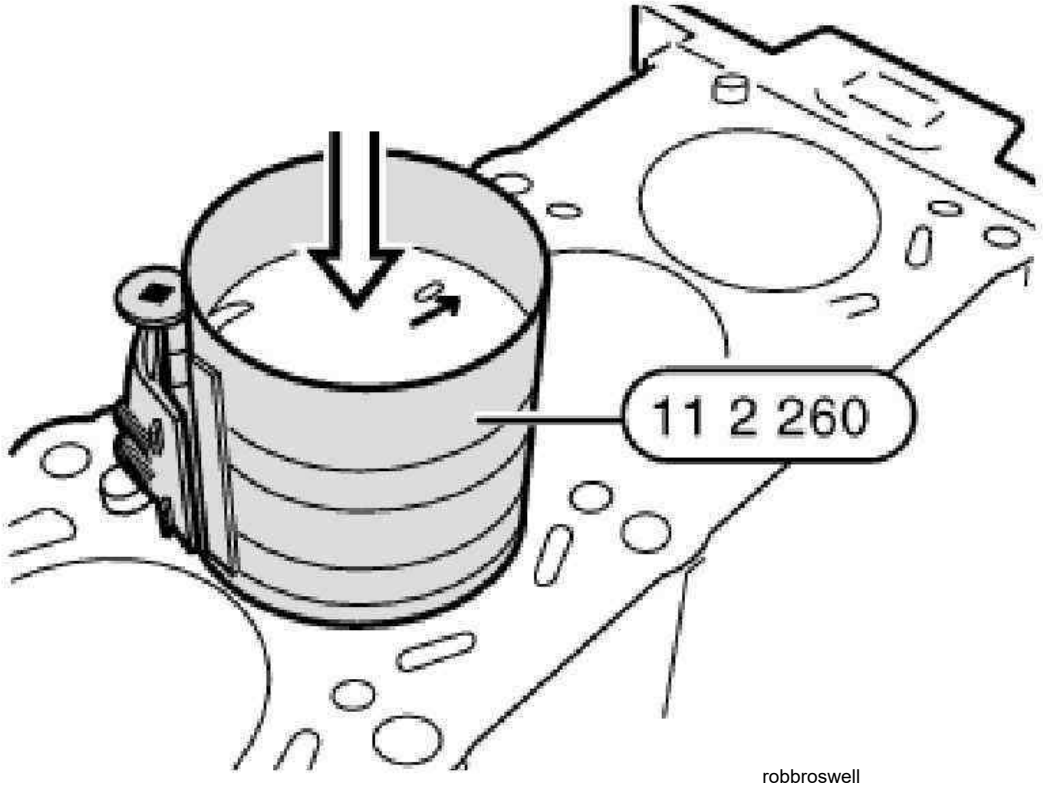


Fig. 139: Installing Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Attach crankpin to connecting rod.

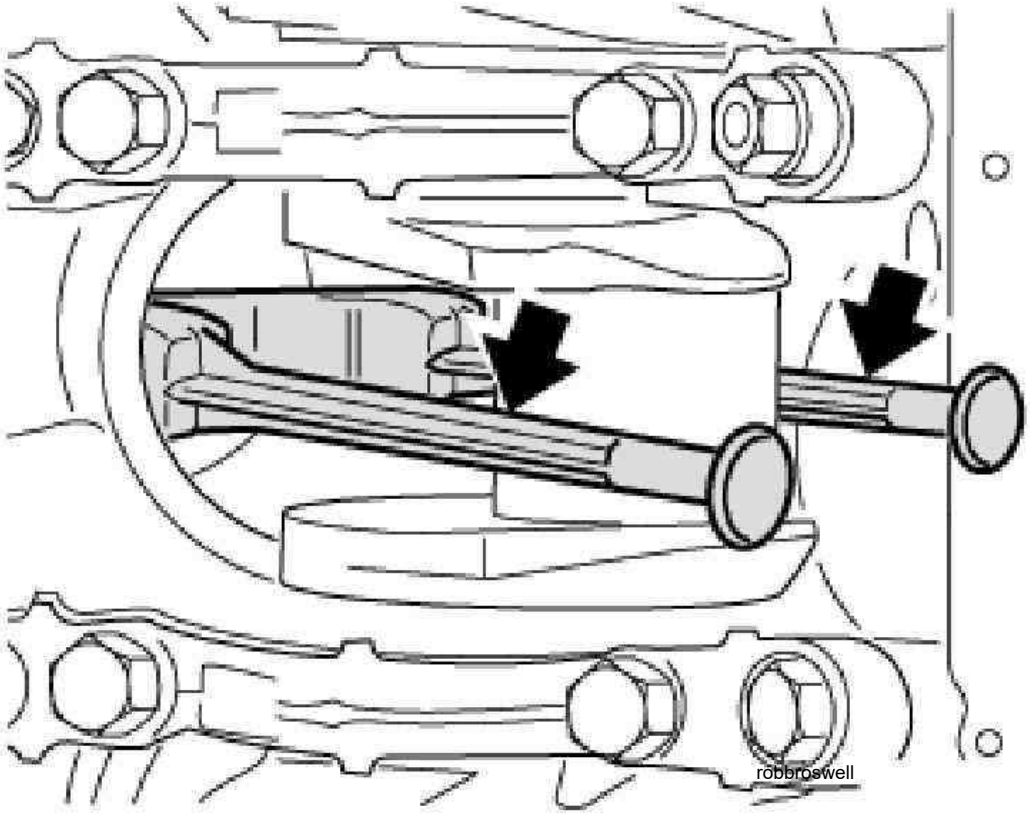


Fig. 140: Attaching Crankpin To Connecting Rod
Courtesy of BMW OF NORTH AMERICA, INC.

Apply light coat of oil to connecting-rod bearing shells.

Fit bearing caps so that pair numbers match up.

Install new conrod bolts.

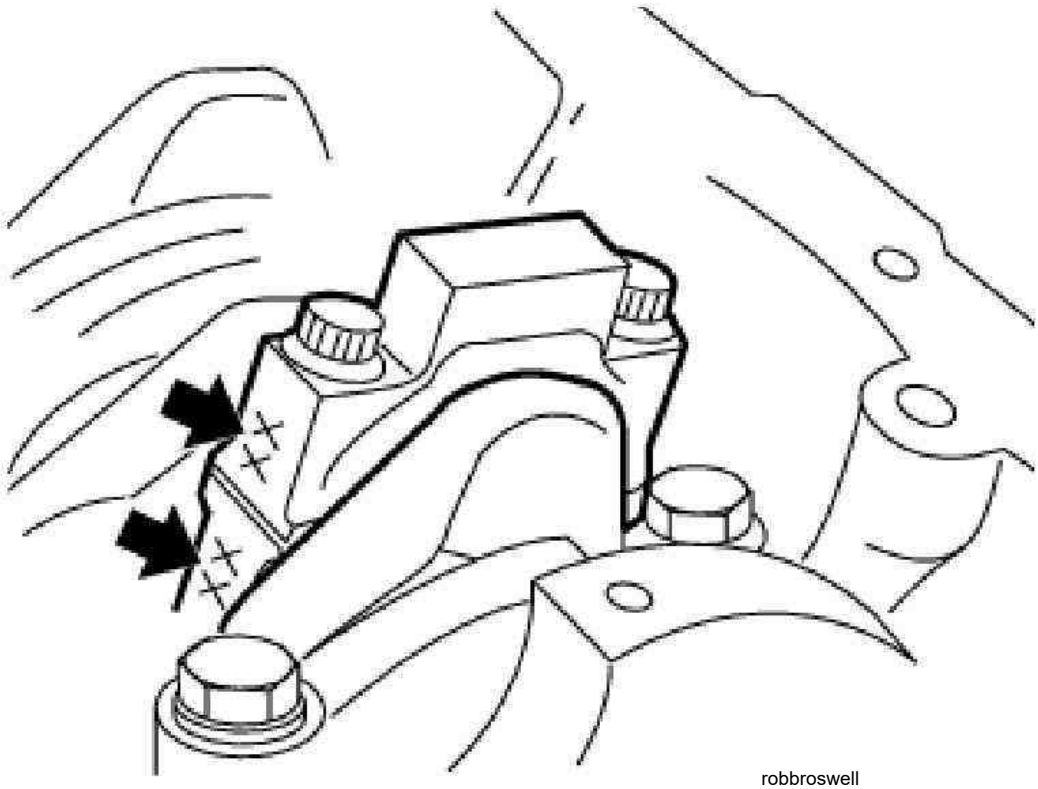
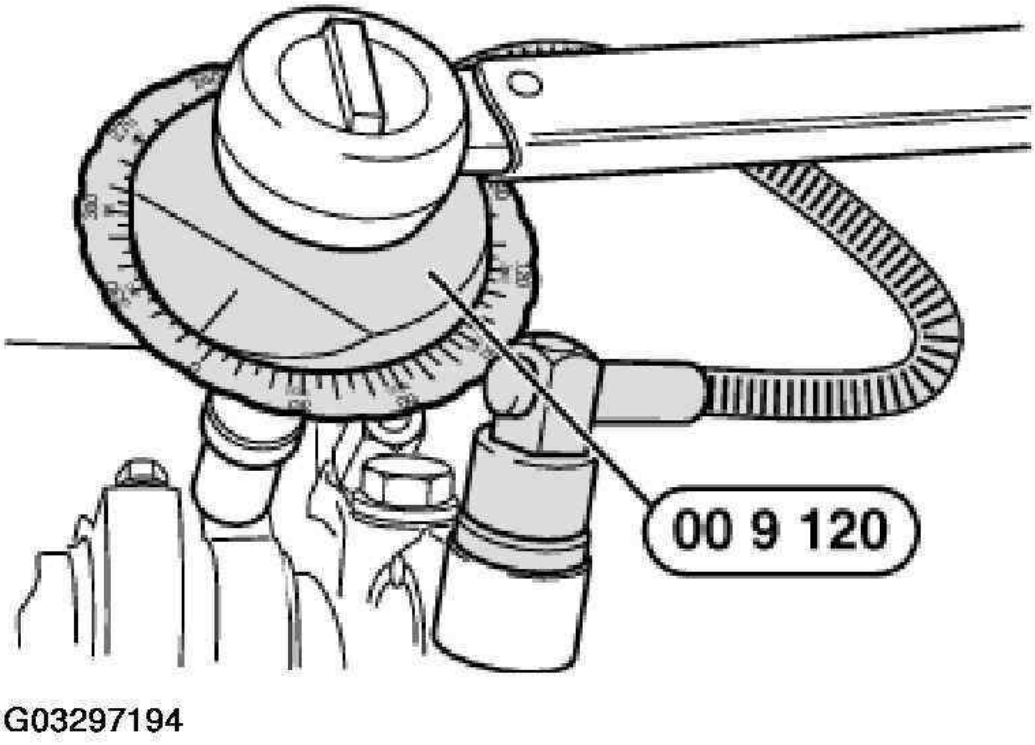


Fig. 141: Fitting Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down conrod bolts with special tool 00 9 120 or special tool 11 2 110.

Tightening torque, see 11 24 1AZ in **ENGINE - TIGHTENING TORQUES** .



robbroswell

Fig. 142: Tightening Down Conrod Bolts With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Install oil pump . See **11 41 000 Removing And Installing/Replacing Oil Pump (M52TU / M54 / M56)**.

If oil pump and oil scraper are two parts:

Fit oil scraper.

Assemble engine.

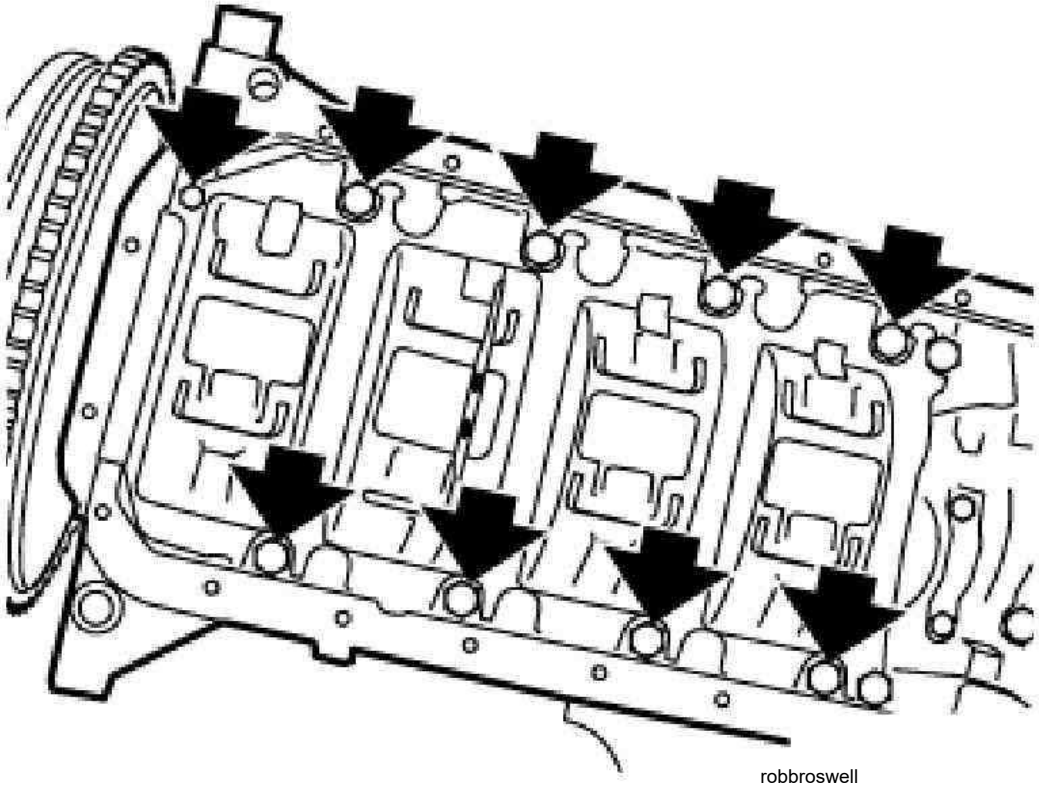


Fig. 143: Fitting Oil Scraper
Courtesy of BMW OF NORTH AMERICA, INC.

11 25 671 REPLACING PISTON RINGS ON ALL PISTONS (M52 / S52 / M52TU / M54 / M56)

(piston removed)

Remove piston rings with a piston-ring compressing pliers.

NOTE: It might not be possible to find the identification on used piston rings.

Put aside piston rings in correct sequence and installation position.

Only install new pistons in conjunction with new piston rings.

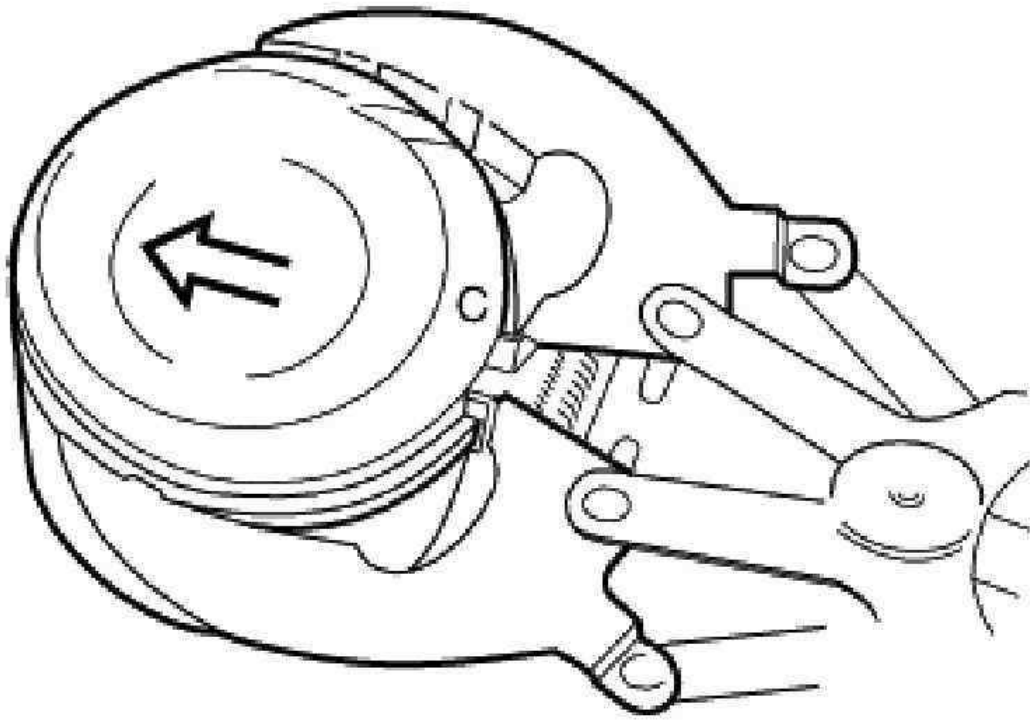


Fig. 144: Removing Piston Rings With Piston-Ring Compressing Pliers
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Install piston rings with "TOP" to piston top.

1. Plain compression ring
2. Stepped compression ring "Top"
3. Slotted oil ring with hose spring clip

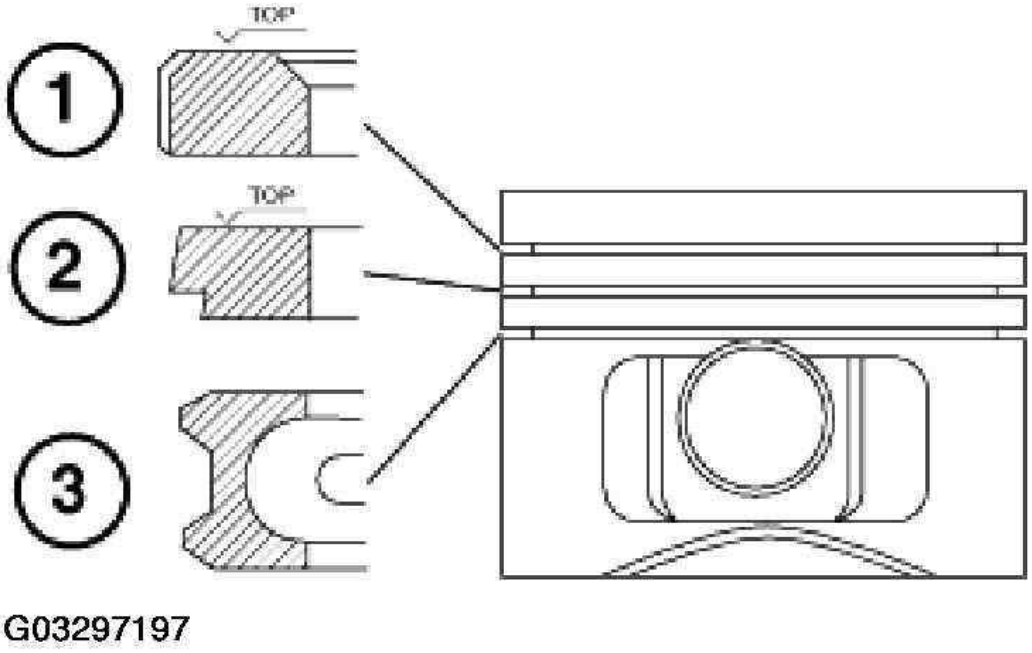


Fig. 145: Installing Piston Rings robbroswell
Courtesy of BMW OF NORTH AMERICA, INC.

Measure axial play .

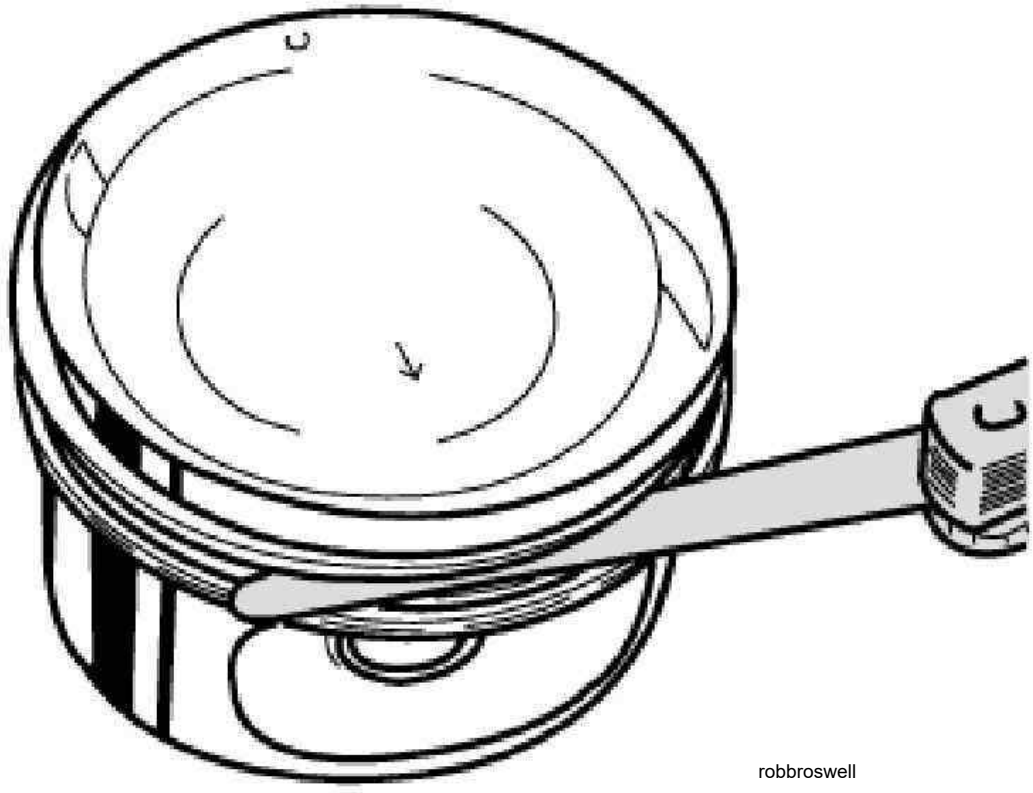


Fig. 146: Measuring Axial Play
Courtesy of BMW OF NORTH AMERICA, INC.

Measure end clearance .

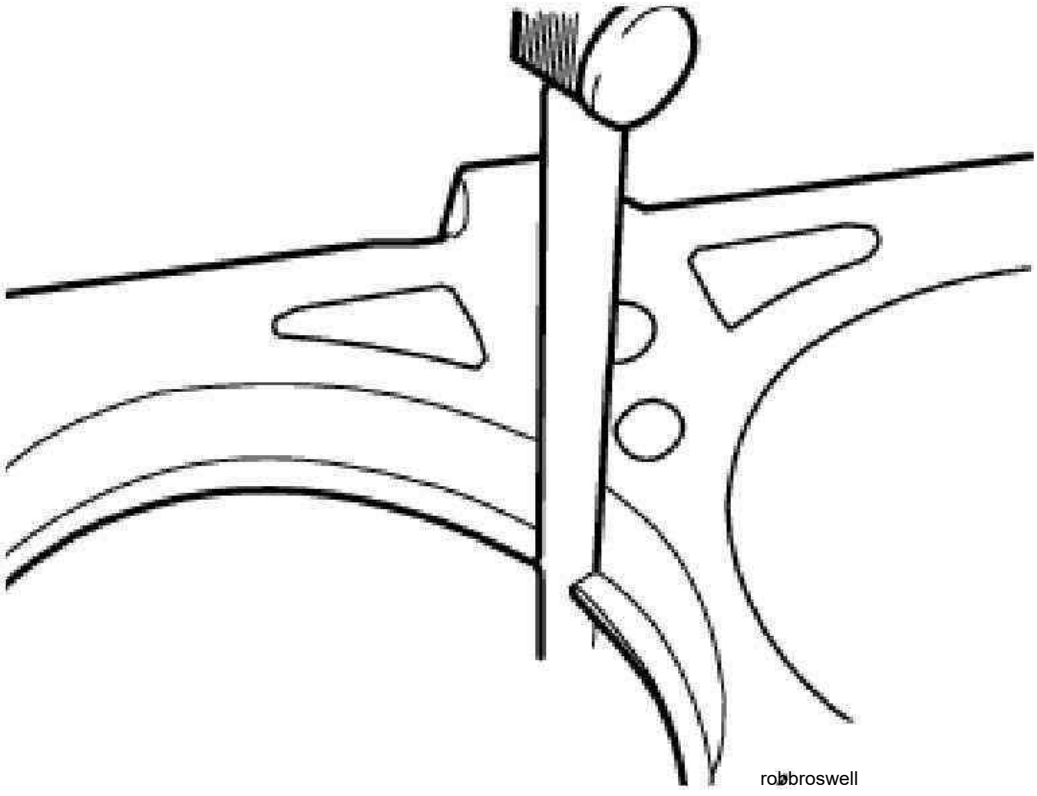


Fig. 147: Measuring End Clearance
Courtesy of BMW OF NORTH AMERICA, INC.

V-RIBBED BELT WITH TENSIONER DEFLECT ELEMENT

11 28 010 REPLACING ALTERNATOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)

NOTE: If the drive belt is to be subsequently reused:
Mark direction of travel and reinstall drive belt in same direction of travel.

Necessary preliminary tasks:

- Remove A/C compressor drive belt See **11 28 050 Replacing A/C Compressor Drive Belt (M52 / S52 / M52TU / M54 / M56)**.
- E85/E60: Remove radiator cover See **RADIATOR COVER** .
- E85/E60: Remove fan cowl See **FAN COWL** .

Remove cap from tensioning roller.

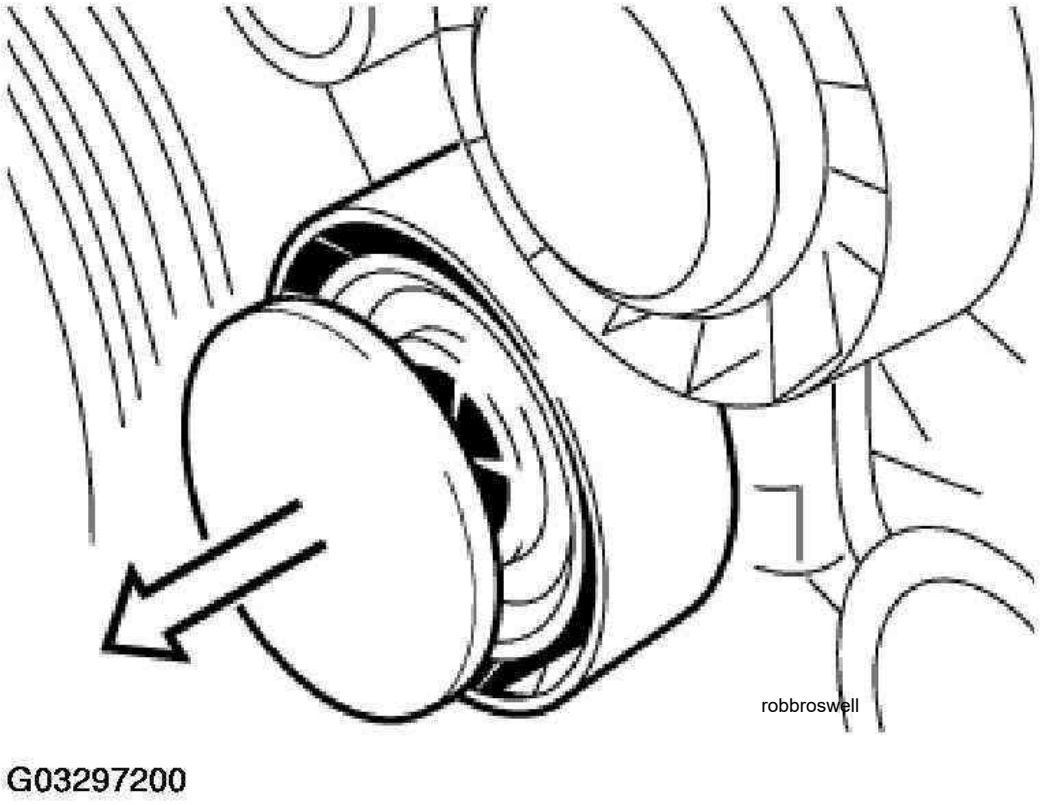


Fig. 148: Removing Cap From Tensioning Roller
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on belt drive.

Remove drive belt.

IMPORTANT: Drive belt must be replaced if fouled with hydraulic fluid.

Installation:

Check drive belt for coolant and oil residues, replace if necessary.

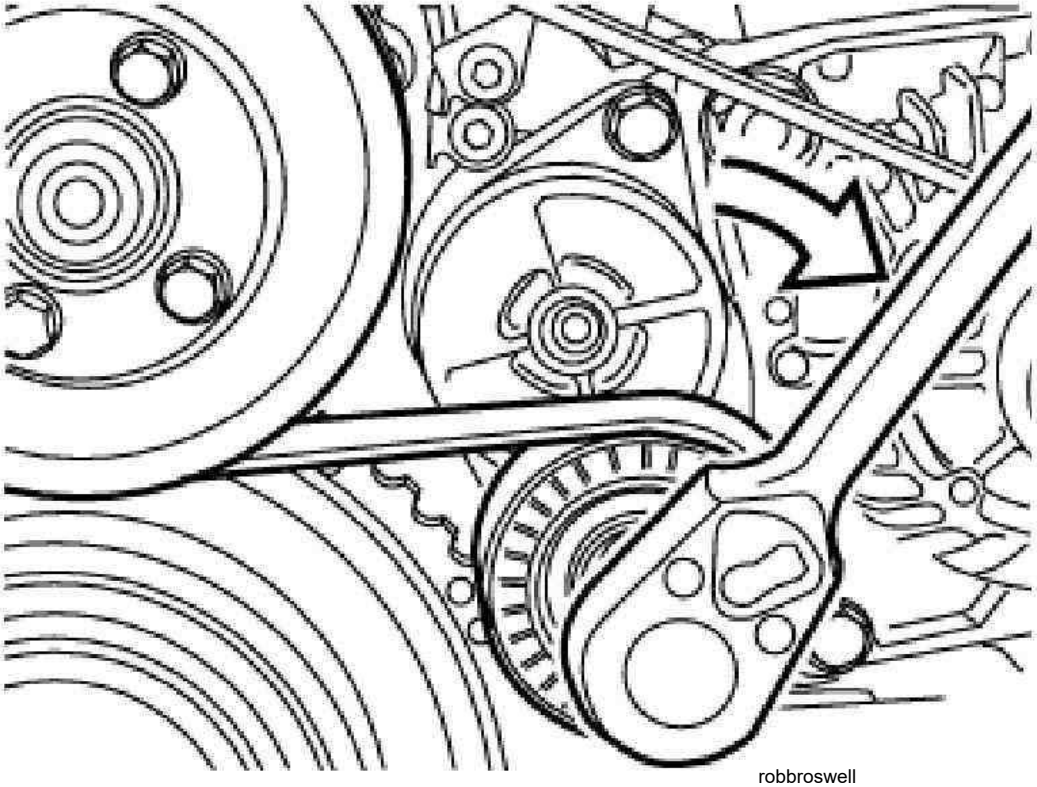


Fig. 149: Removing Drive Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check that belt is correctly positioned on belt pulleys.

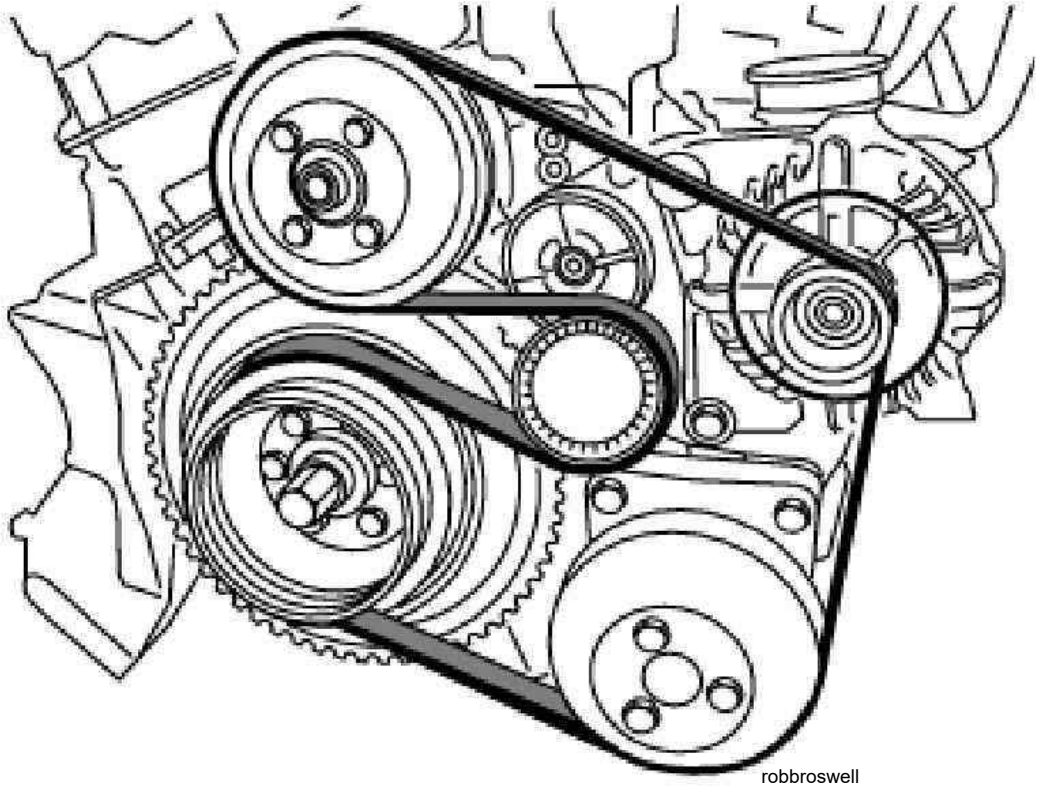
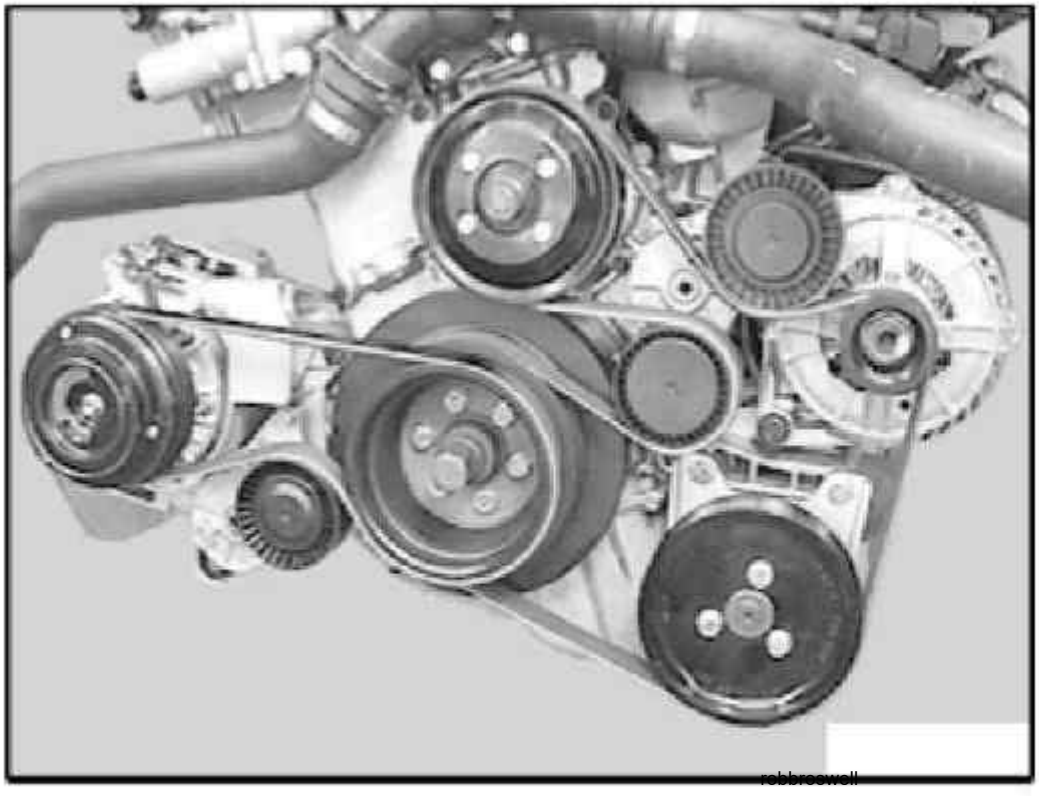


Fig. 150: Checking Belt
Courtesy of BMW OF NORTH AMERICA, INC.

Version with auxiliary tensioning roller.



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Fig. 151: Identifying Version With Auxiliary Tensioning Roller
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Locking device of auxiliary tensioning roller must snap into groove on alternator.



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Fig. 152: Identifying Locking Device Of Auxiliary Tensioning Roller
Courtesy of BMW OF NORTH AMERICA, INC.

Version on E85.

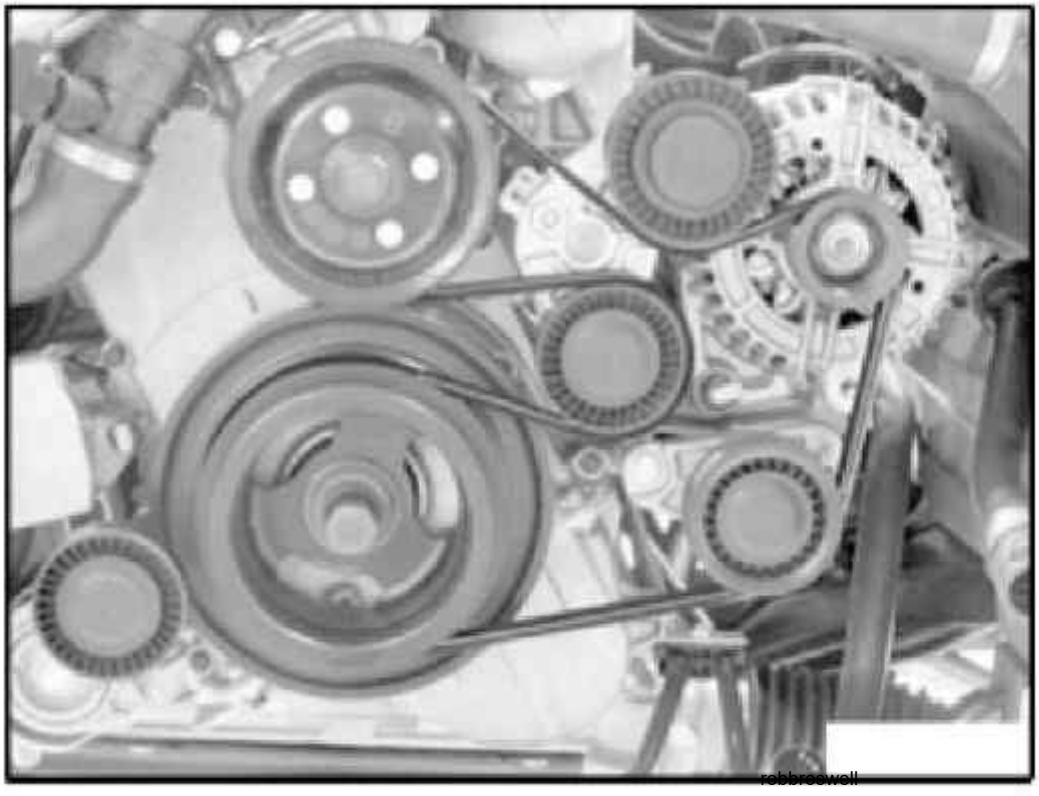


Fig. 153: Identifying Version On E85
Courtesy of BMW OF NORTH AMERICA, INC.

Version on E60/E65.

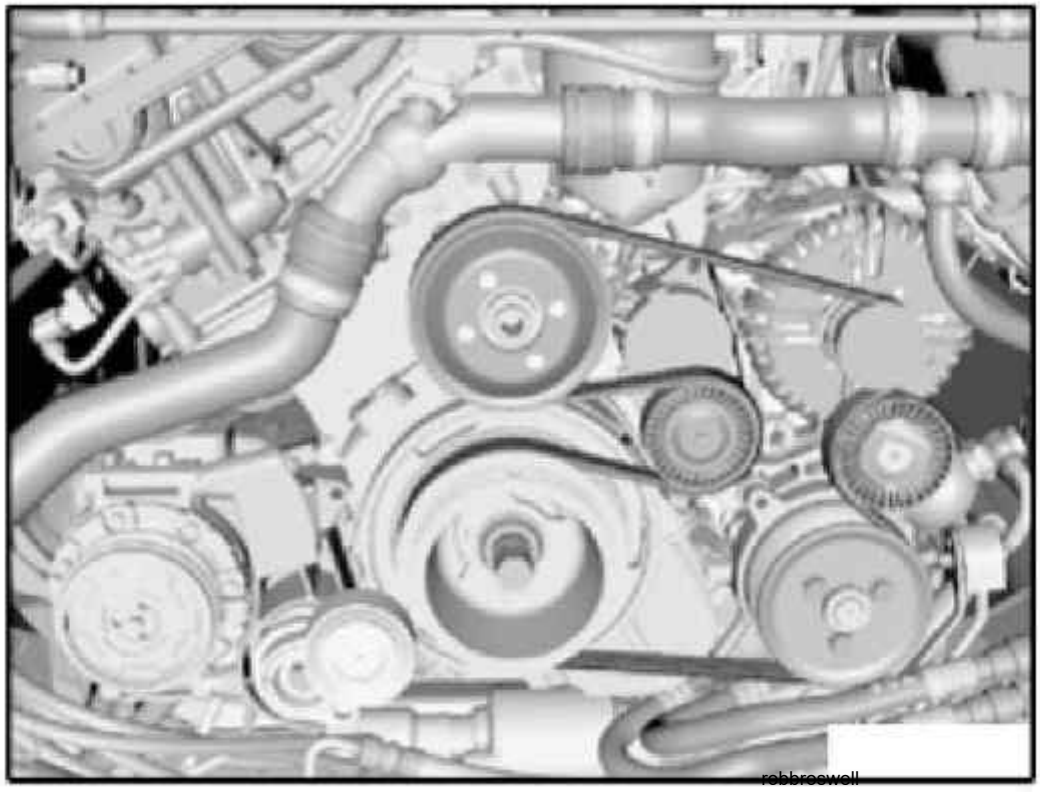


Fig. 154: Identifying Version On E60/E65
Courtesy of BMW OF NORTH AMERICA, INC.

11 28 020 REPLACING ALTERNATOR DRIVE BELT TENSIONER (M52 / S52 / M52TU / M54)

Necessary preliminary tasks:

- Remove alternator drive belt . See **11 28 010 Replacing Alternator Drive Belt (M52 / S52 / M52TU / M54 / M56)**.

NOTE: Version with auxiliary tensioning roller:
Remove auxiliary tensioning roller.

Installation:

Locking device of auxiliary tensioning roller must snap into groove on alternator.



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Fig. 155: Removing Auxiliary Tensioning Roller
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws for drive belt tensioner.

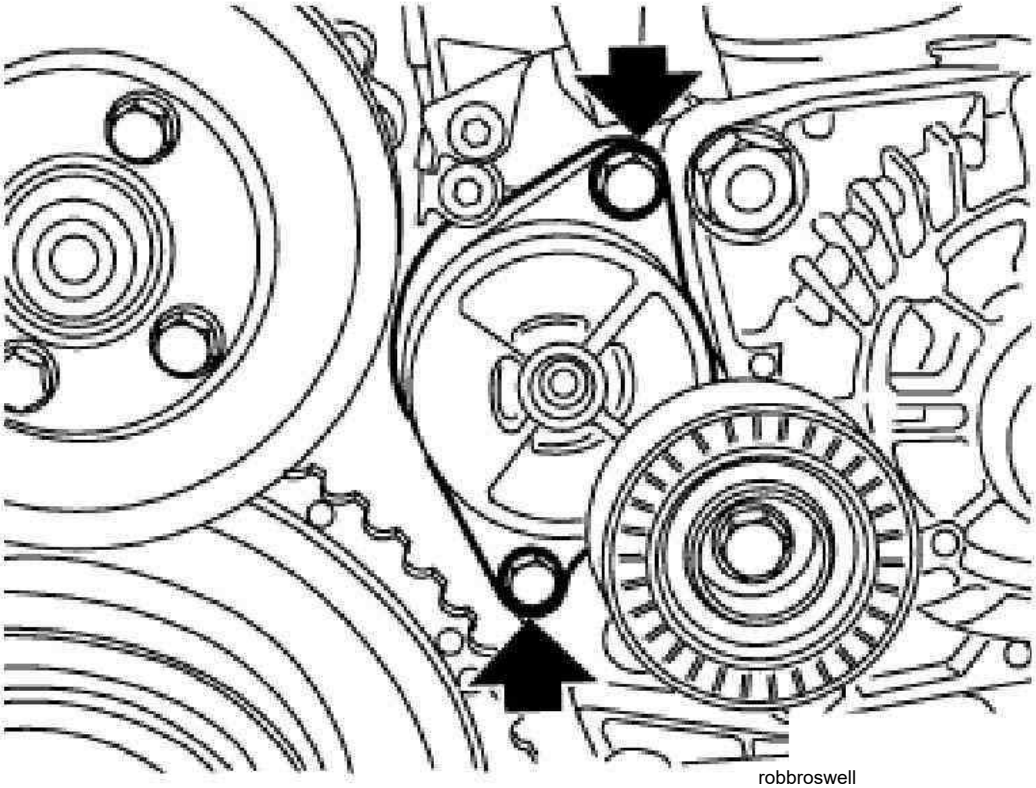


Fig. 156: Releasing Screws For Drive Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

11 28 050 REPLACING A/C COMPRESSOR DRIVE BELT (M52 / S52 / M52TU / M54 / M56)

NOTE: If the drive belt is to be subsequently reused:
Mark direction of travel and reinstall drive belt in same direction of travel.

Necessary preliminary tasks:

- If necessary, remove splash guard.

Model with hydraulic drive belt and tension jack:

Remove the dust cab. Push back belt tensioner at bolt connection of guide pulley and remove drive belt.

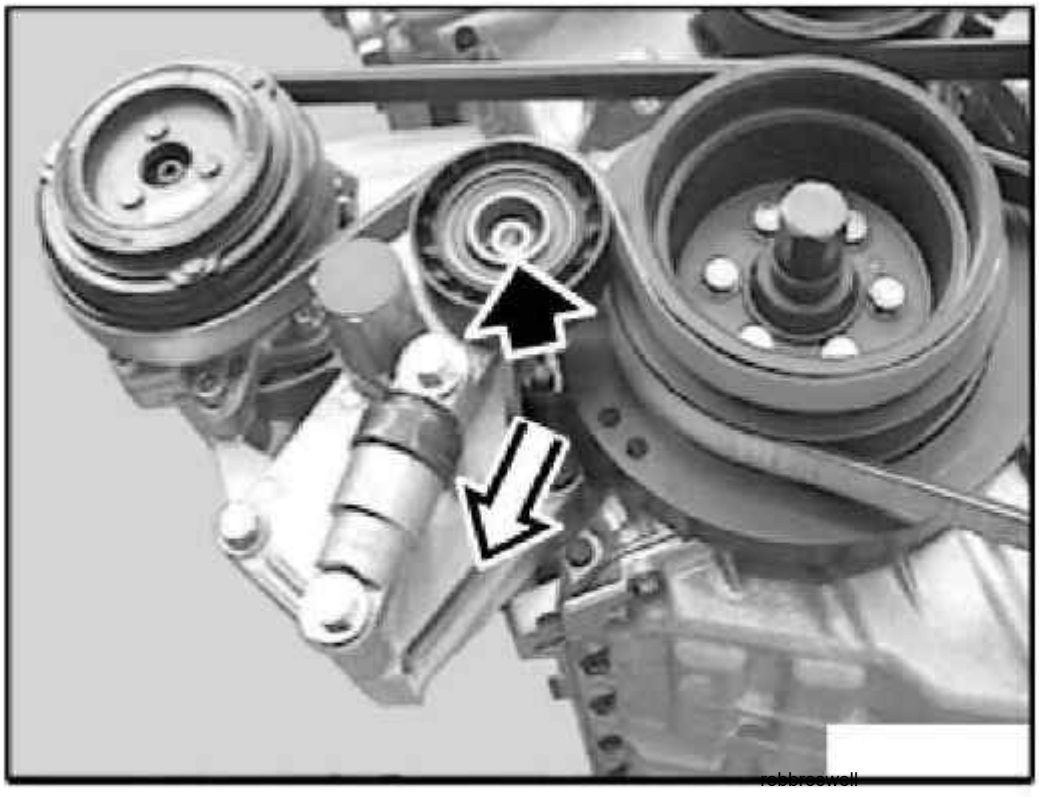


Fig. 157: Identifying Back Belt Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Model with mechanical drive belt and tension jack:

Press back drive belt tensioner at hexagon head or Torx socket and remove drive belt.

IMPORTANT: Drive belt must be replaced if fouled with hydraulic fluid.

Installation:

Check drive belt for coolant and oil residues, replace if necessary.

Install drive belt, make sure it is correctly positioned on belt pulleys.

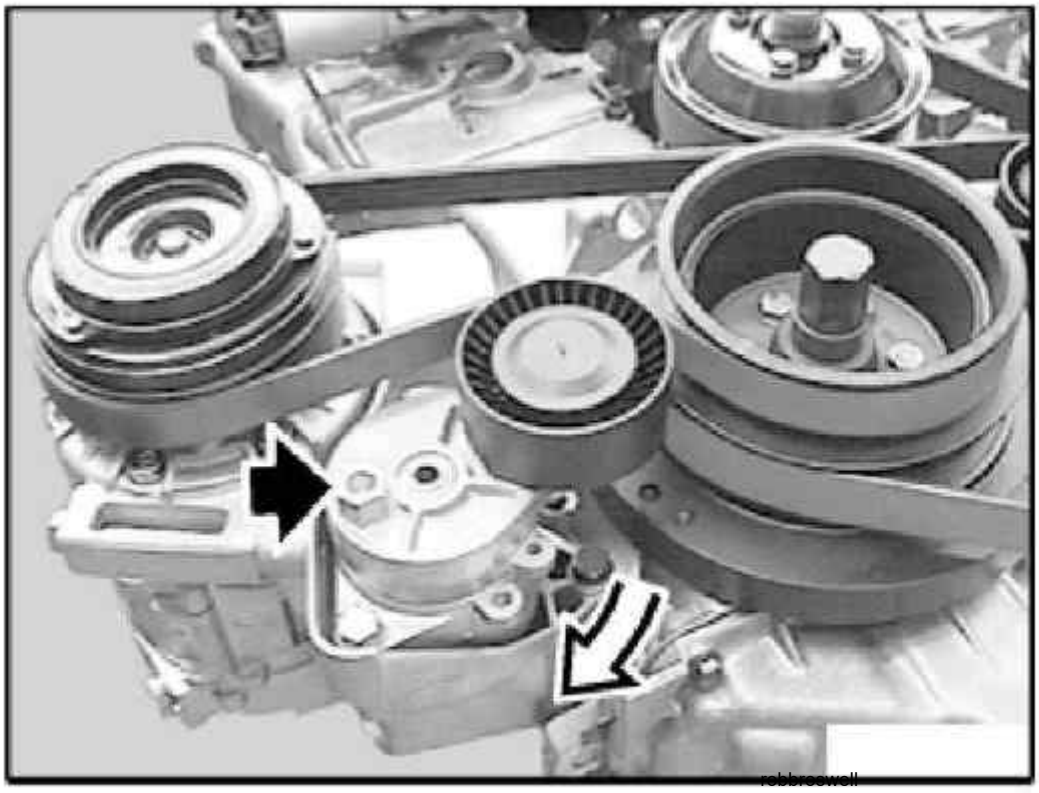


Fig. 158: Identifying Model With Mechanical Drive Belt And Tension Jack
Courtesy of BMW OF NORTH AMERICA, INC.

CAMSHAFT

11 31 001 REPLACING CAMSHAFT (M52TU / M54 / M56)

Special tools required:

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 244
- 11 3 250
- 11 3 260
- 11 3 292

- 11 4 220
- 11 6 150
- 11 6 180

(if necessary inlet or exhaust side)

The inlet or exhaust camshaft can be replaced in the vehicle.

IMPORTANT: Incorrect assembly/removal without special tools exposes the camshaft to the risk of preliminary damage or breakage. The valves may also be bent by contact with the piston crown. Comply without fail with the job instructions, recommended special tools and work sequence.

Removal

Removal of camshafts is described separately from installation.

The assembly sequence for removal and installation is different.

Remove VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

IMPORTANT: Cylinder for chain tensioning piston is under spring pressure.

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Unfasten cylinder for chain tensioning piston.

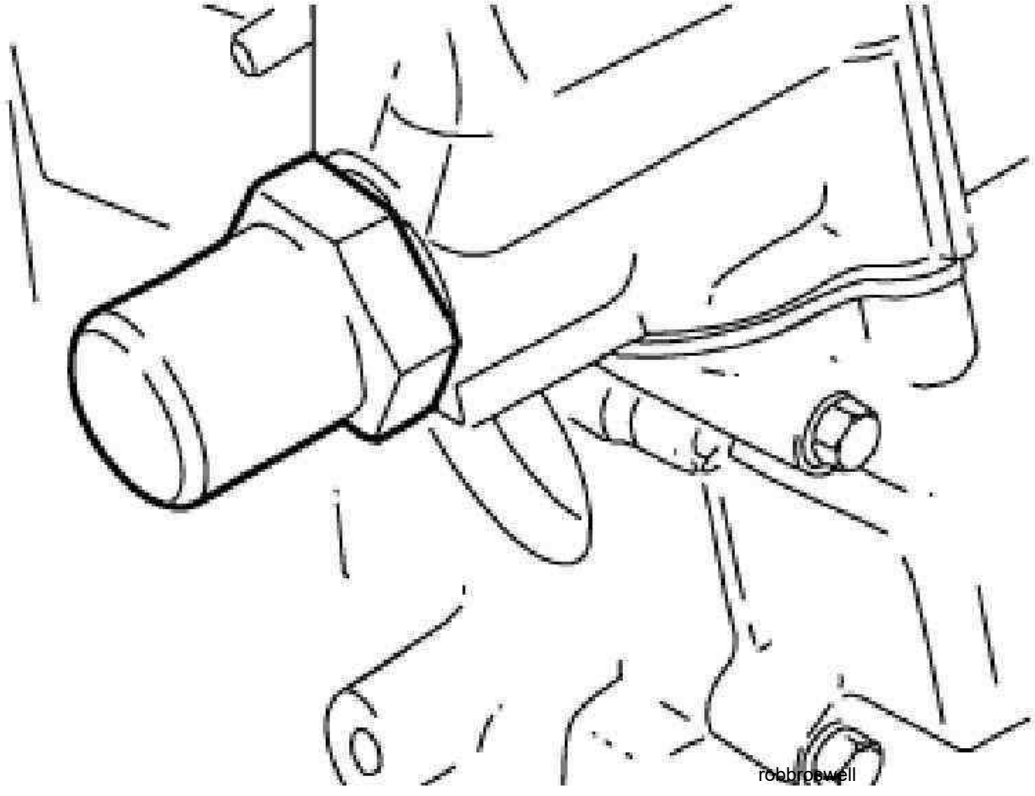


Fig. 159: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Press down secondary chain tensioner at top and lock with special tool 11 3 292.

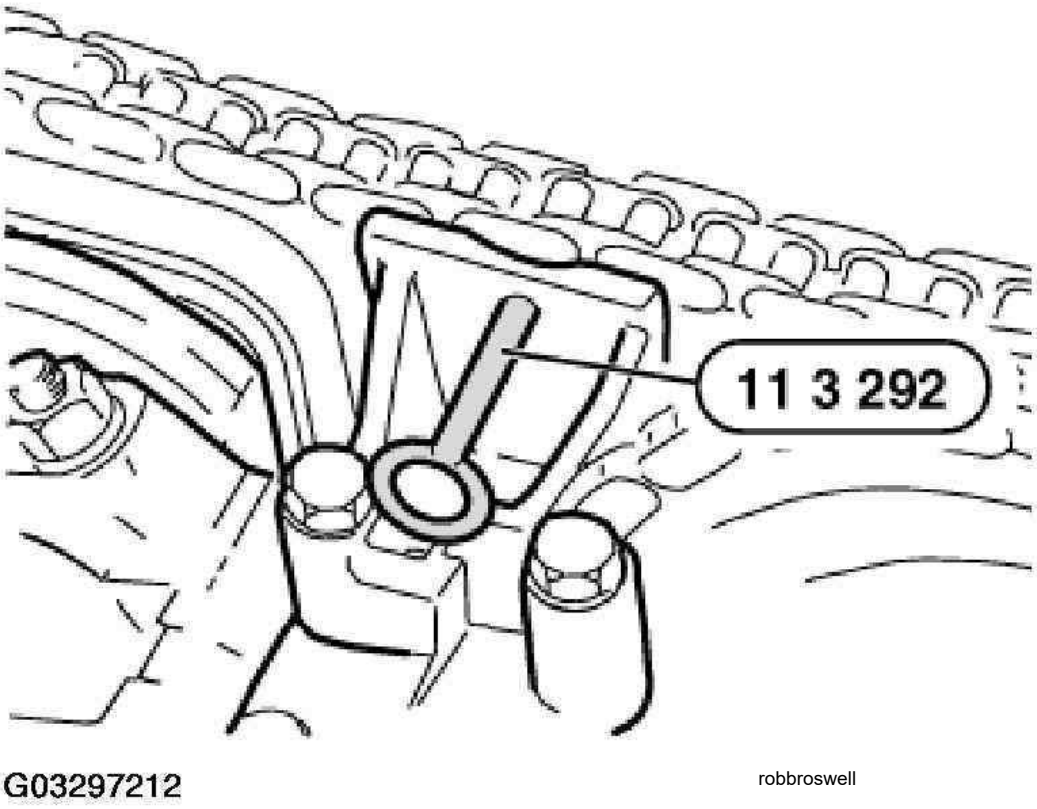
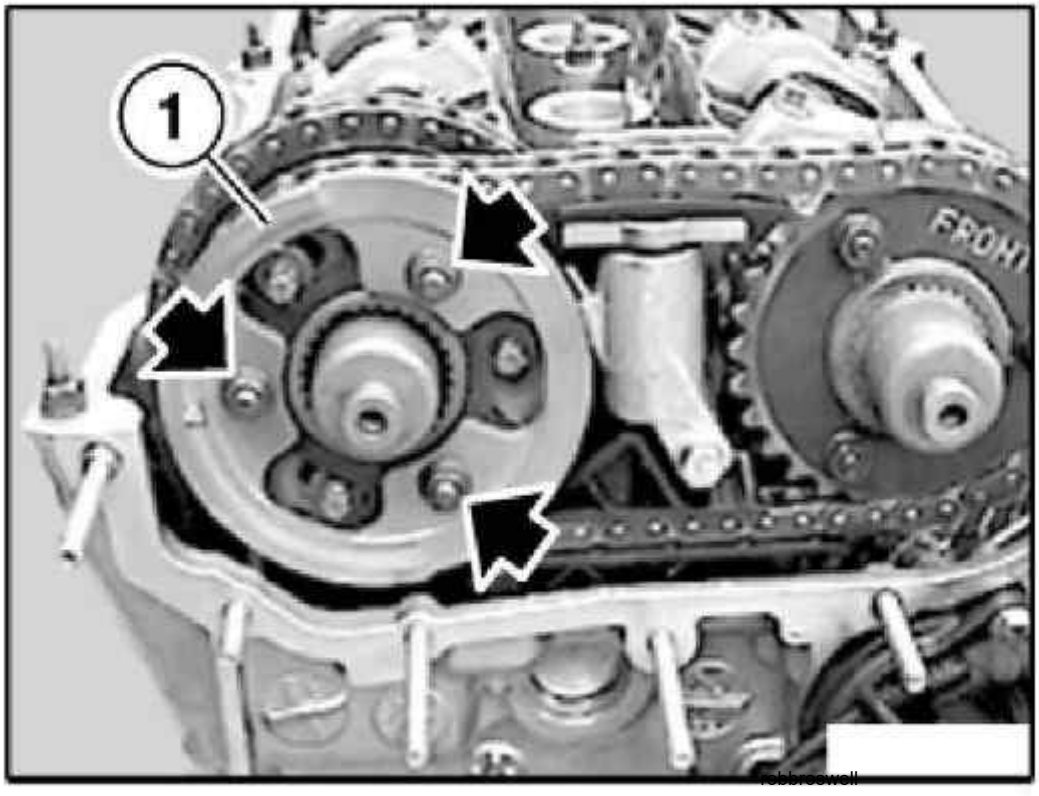


Fig. 160: Pressing Down Secondary Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts, remove sensor gear (1).



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Fig. 161: Removing Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Remove plate spring (2).

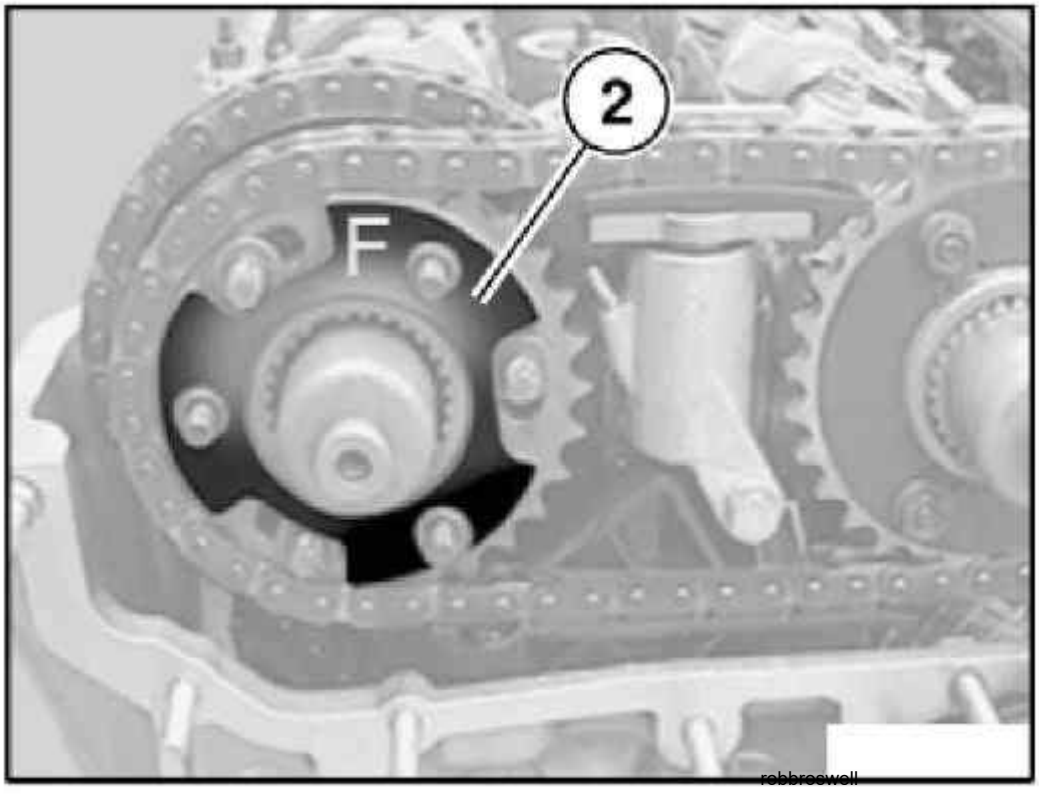
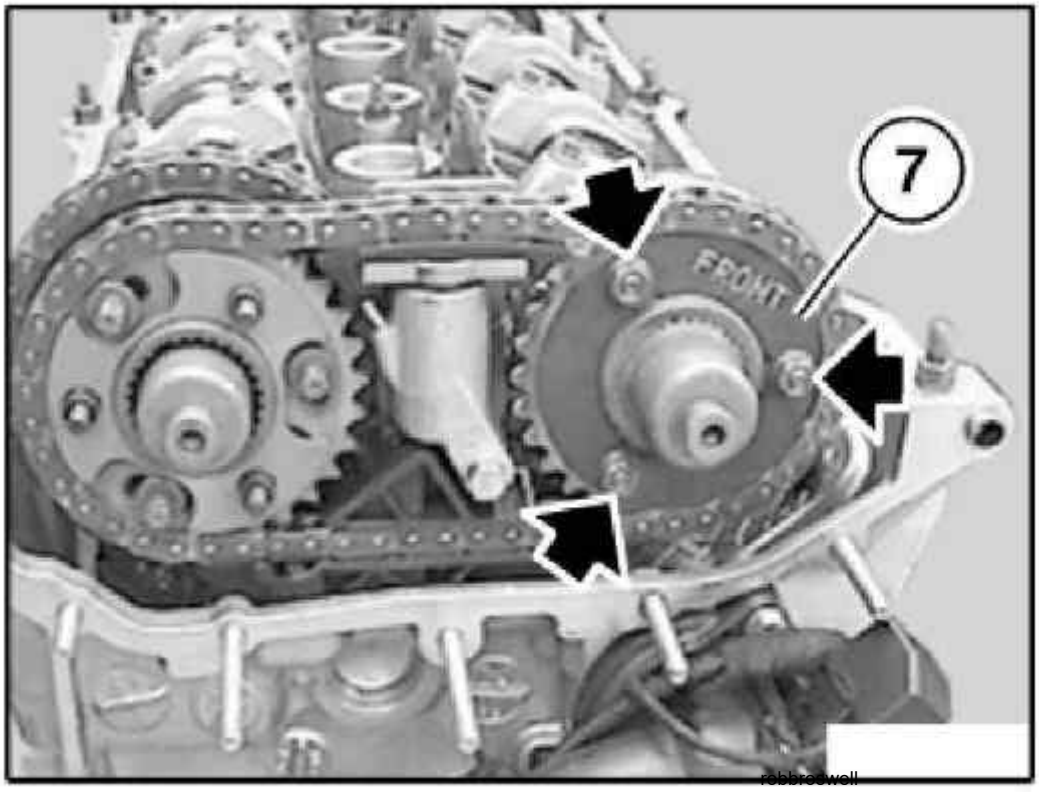


Fig. 162: Removing Plate Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts on inlet side and remove corrugated washer (7).



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Fig. 163: Releasing Nuts On Inlet Side
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws.

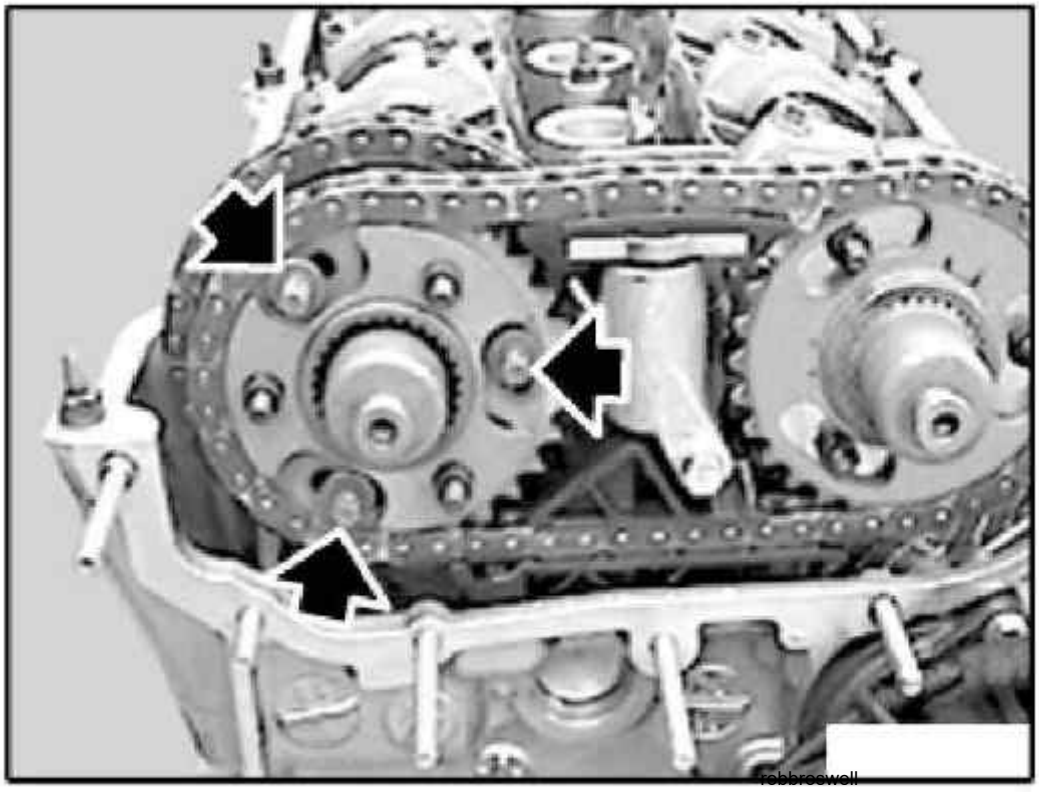


Fig. 164: Removing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Lift off exhaust and inlet chain wheels together with chain, friction washer (3) and toothed shaft (4).

NOTE: Toothed shaft (4) is and identical part for exhaust and inlet sides. Store used toothed shafts in order and reinstall on the same side only.

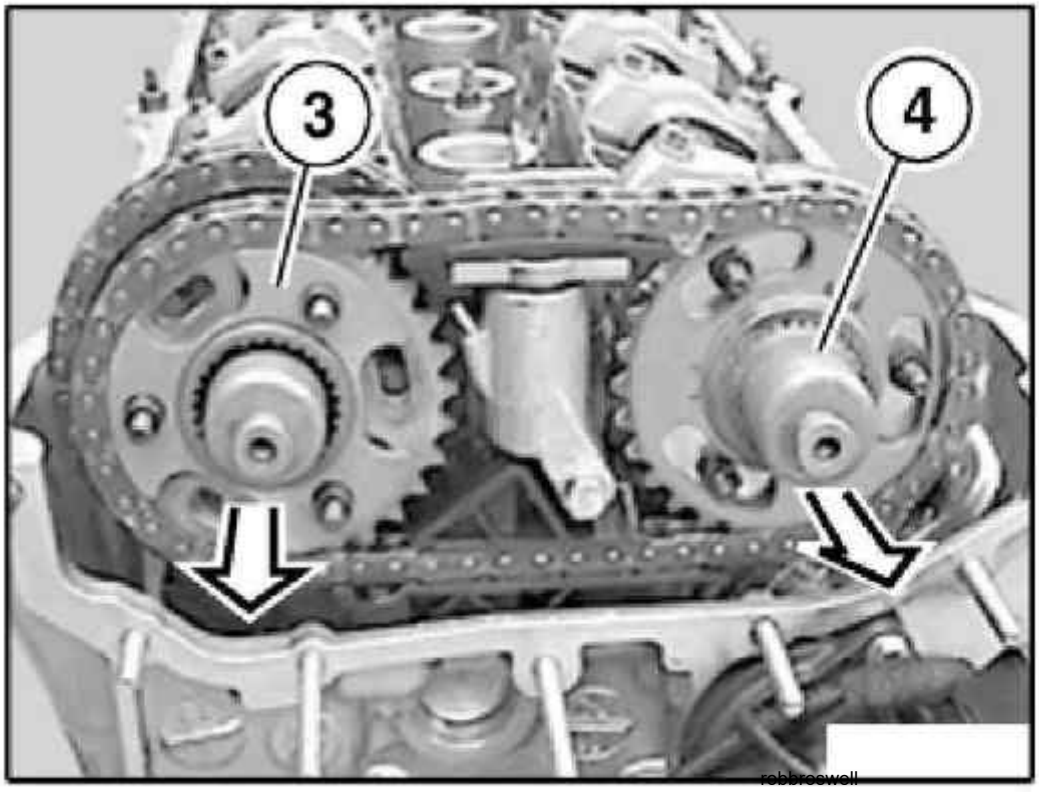
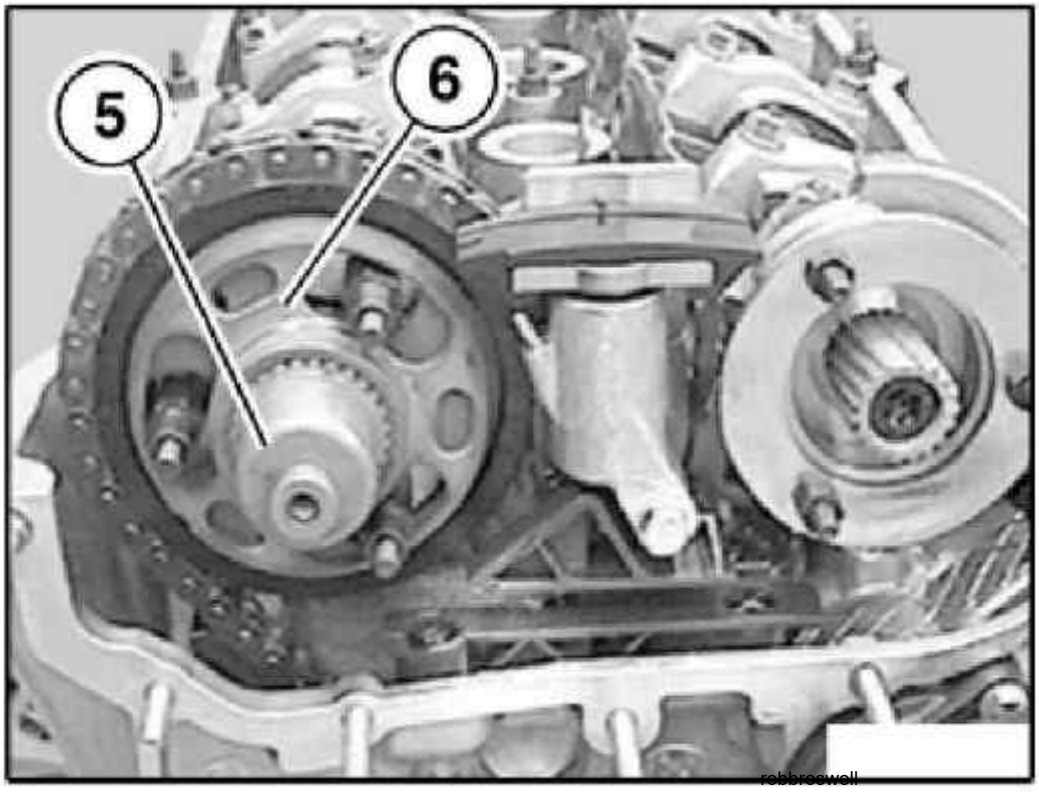


Fig. 165: Identifying Toothed Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Remove toothed shaft (5) with toothed sleeve (6).



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Fig. 166: Removing Toothed Shaft With Toothed Sleeve
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten screws. Remove secondary chain tensioner.

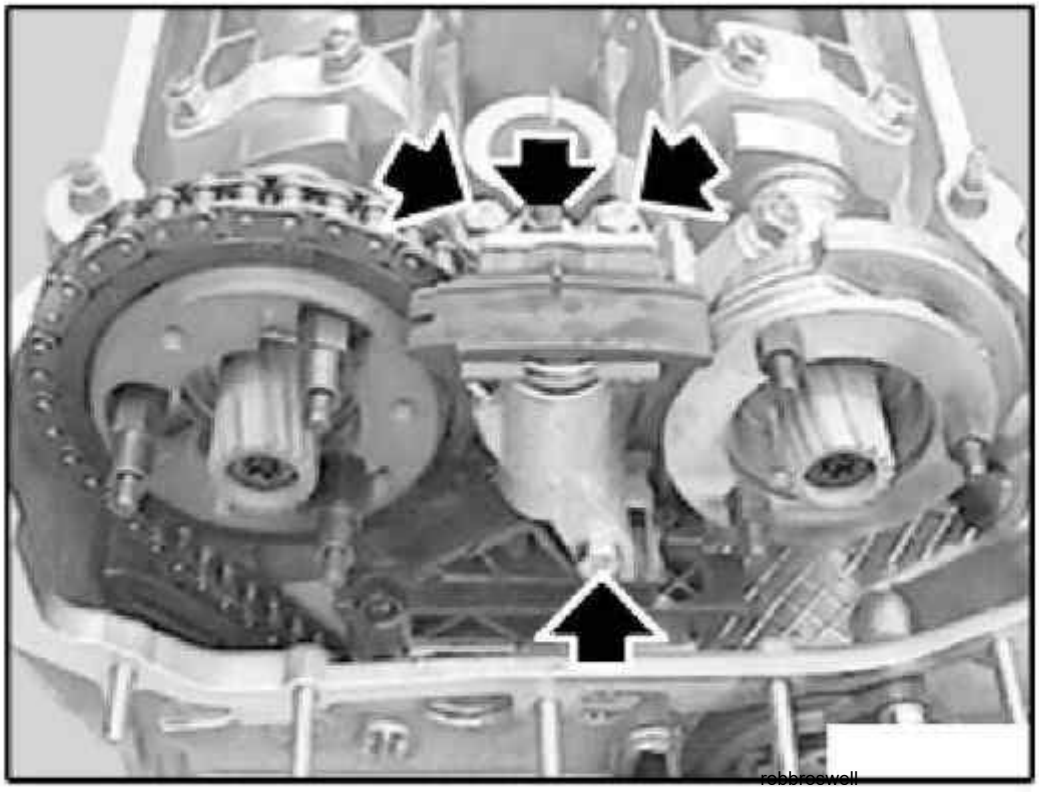


Fig. 167: Removing Secondary Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Release screw-in pin.

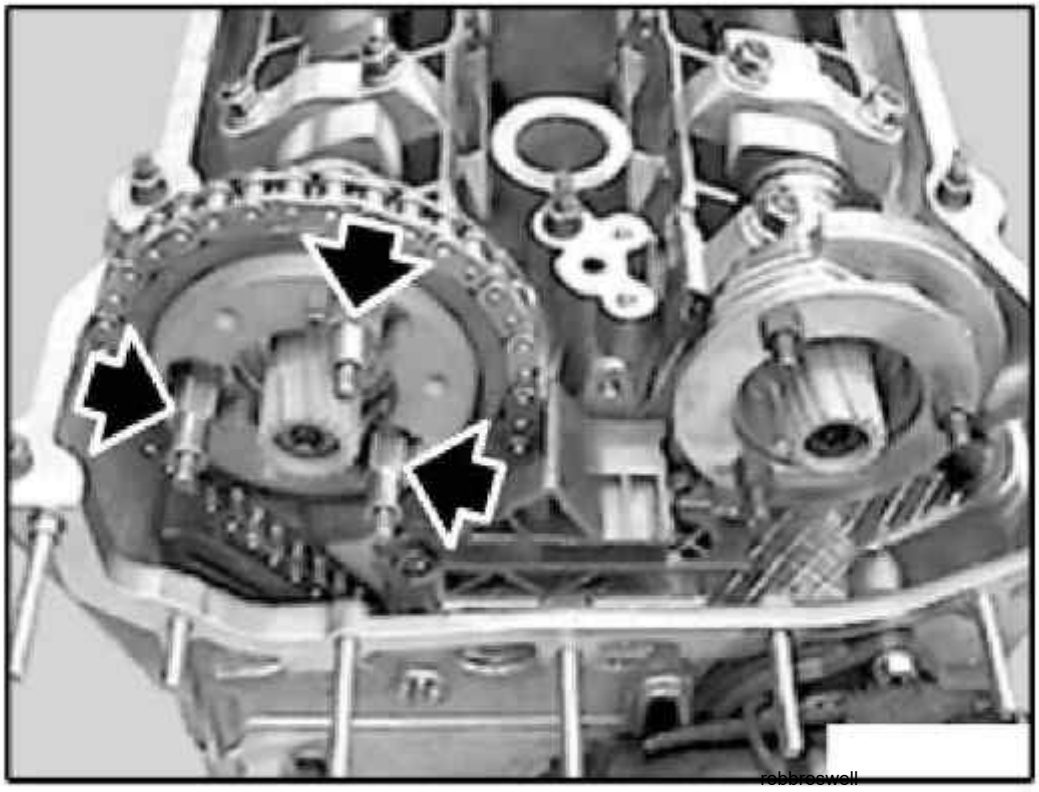


Fig. 168: Releasing Screw-In Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Feed chain wheel (1) towards front out of timing chain (2).

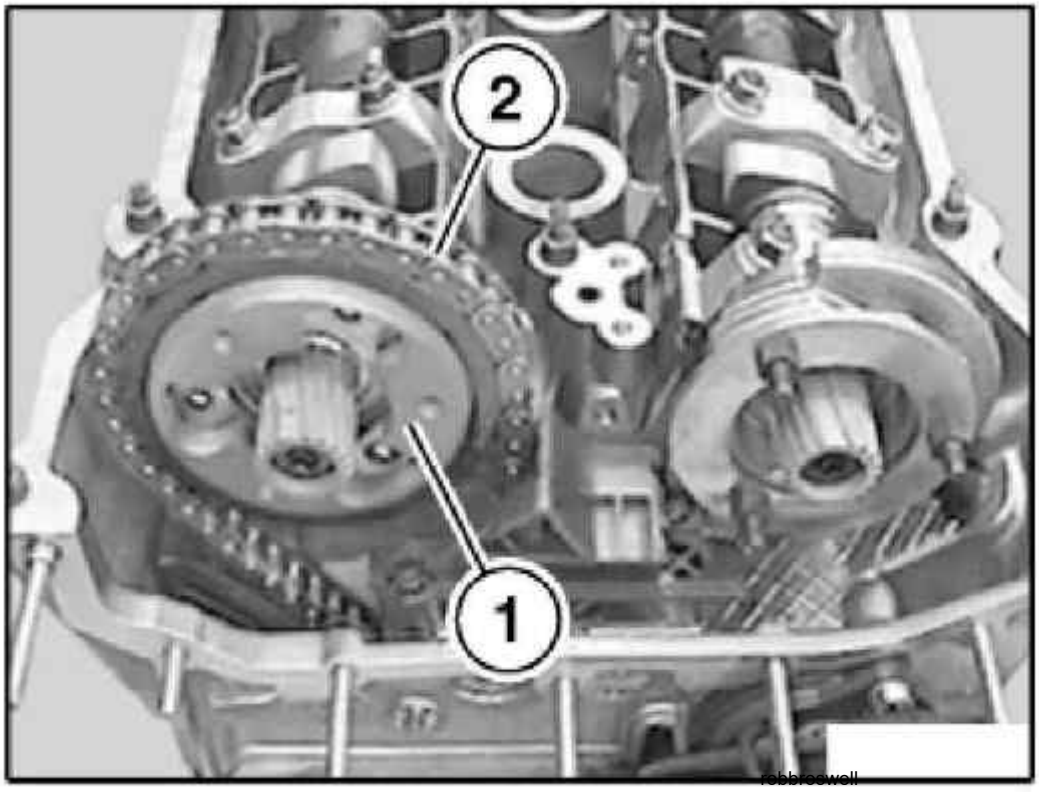


Fig. 169: Removing Chain Wheel
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Timing chain remains positioned over exhaust camshaft.

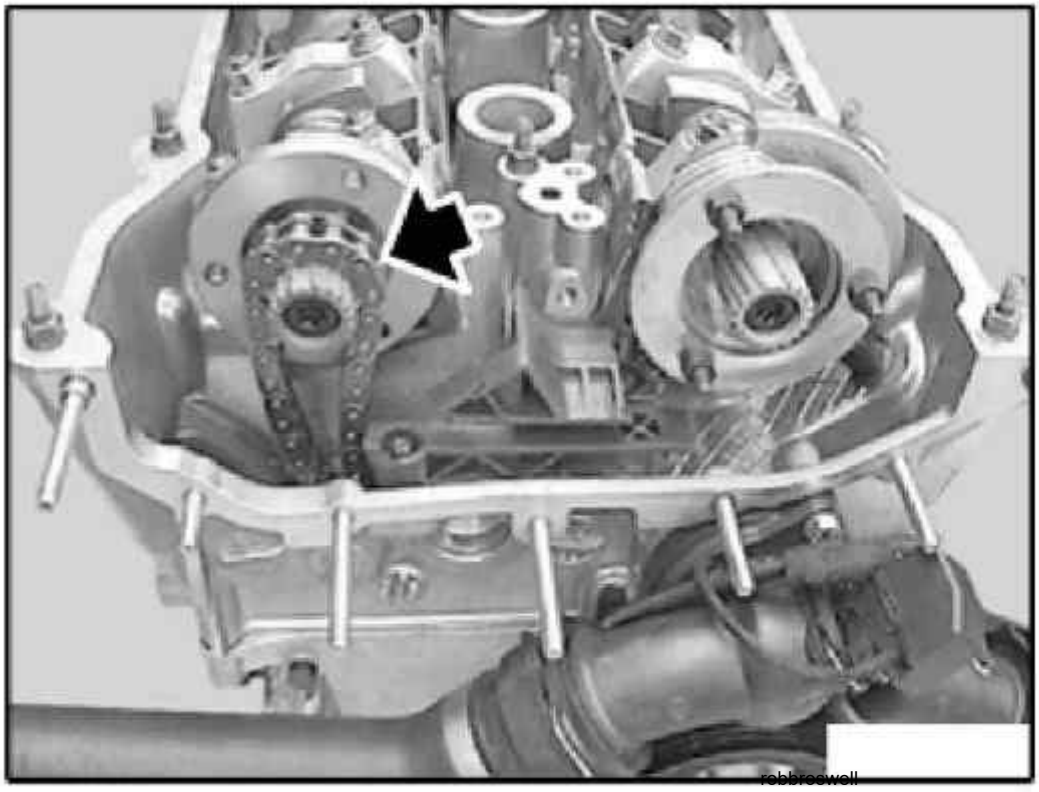


Fig. 170: Identifying Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, release screw-in pin on inlet side.

Remove thrust washer.

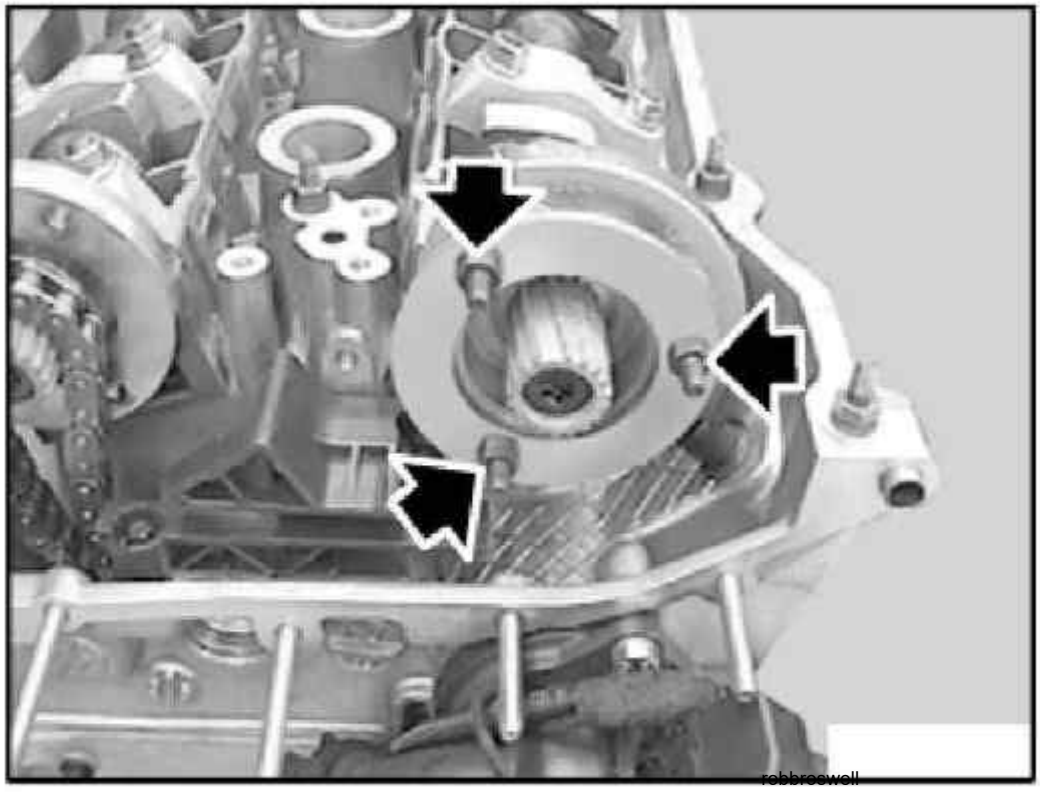


Fig. 171: Removing Thrust Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sensor gear.

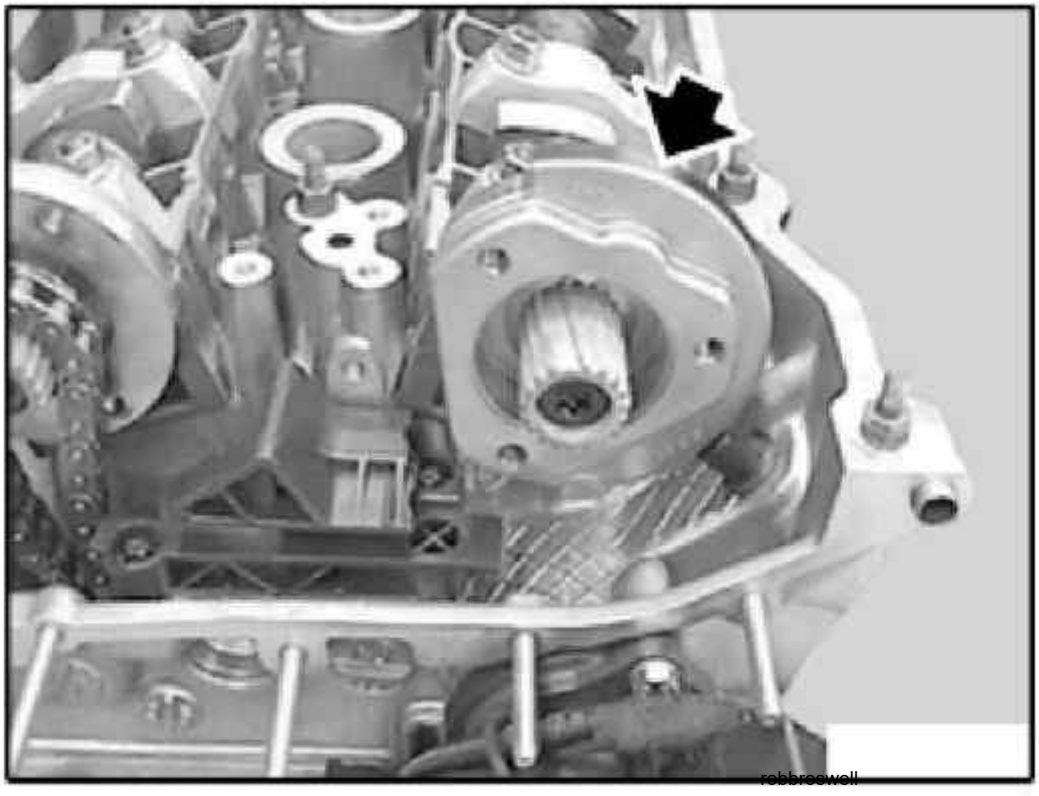


Fig. 172: Removing Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do "not" release these screws.

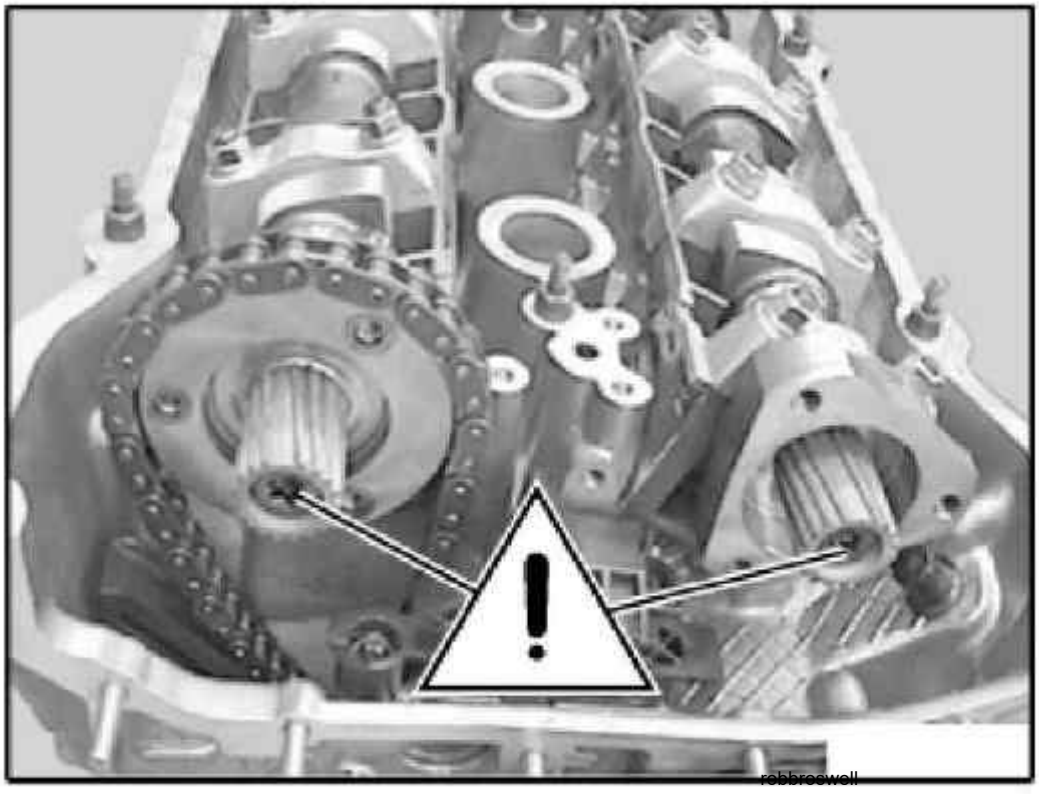


Fig. 173: Identifying Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

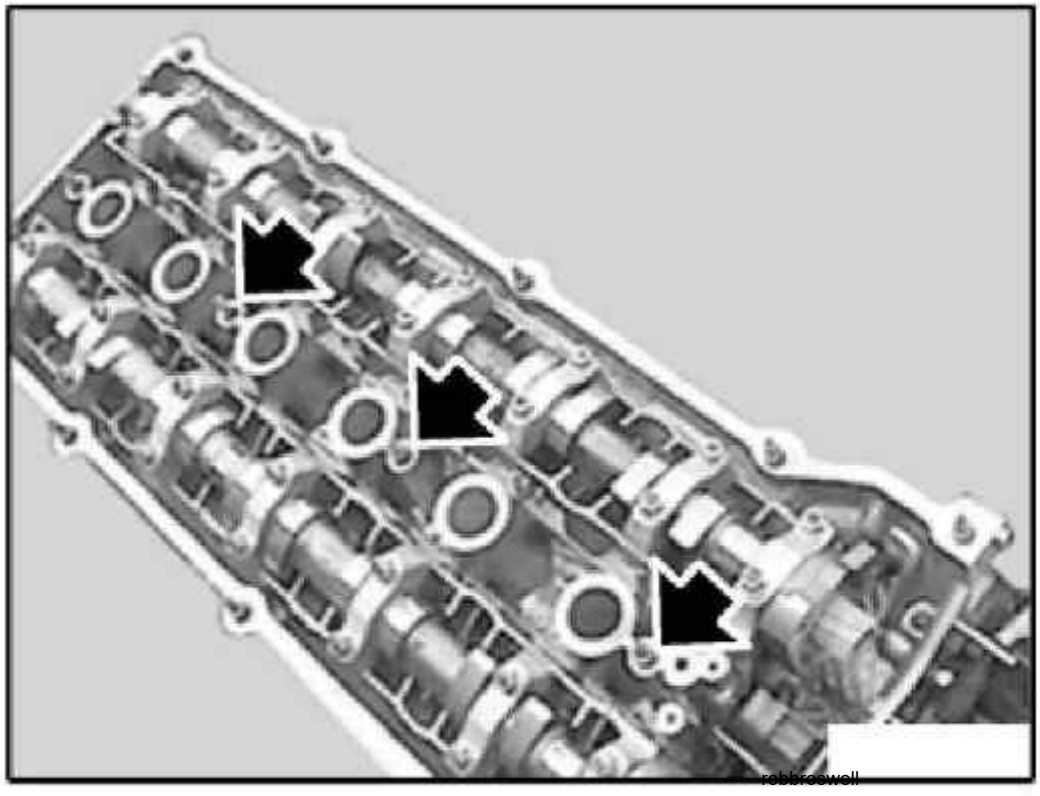


Fig. 174: Removing Studs
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 back until flywheel is no longer secured in position.

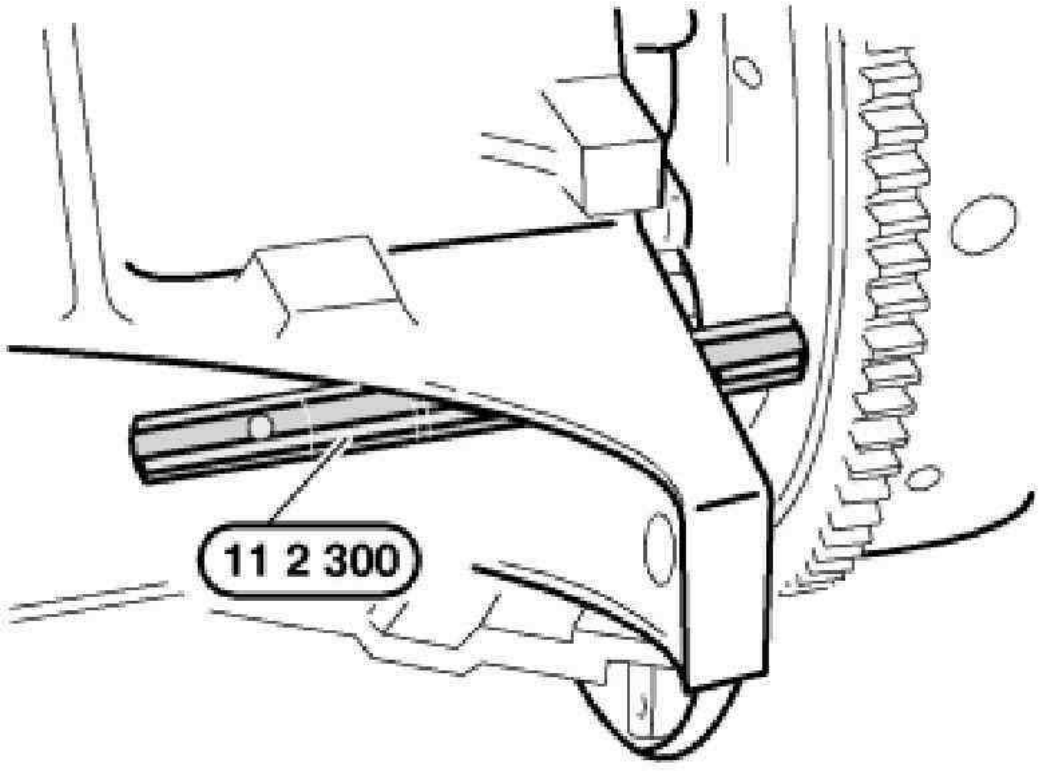


Fig. 175: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: To prevent damaging valves when fitting the camshafts, no pistons should be in TDC position.
Lift timing chain and hold under tension.
Rotate engine against direction of engine rotation approx. 30° using the central bolt.

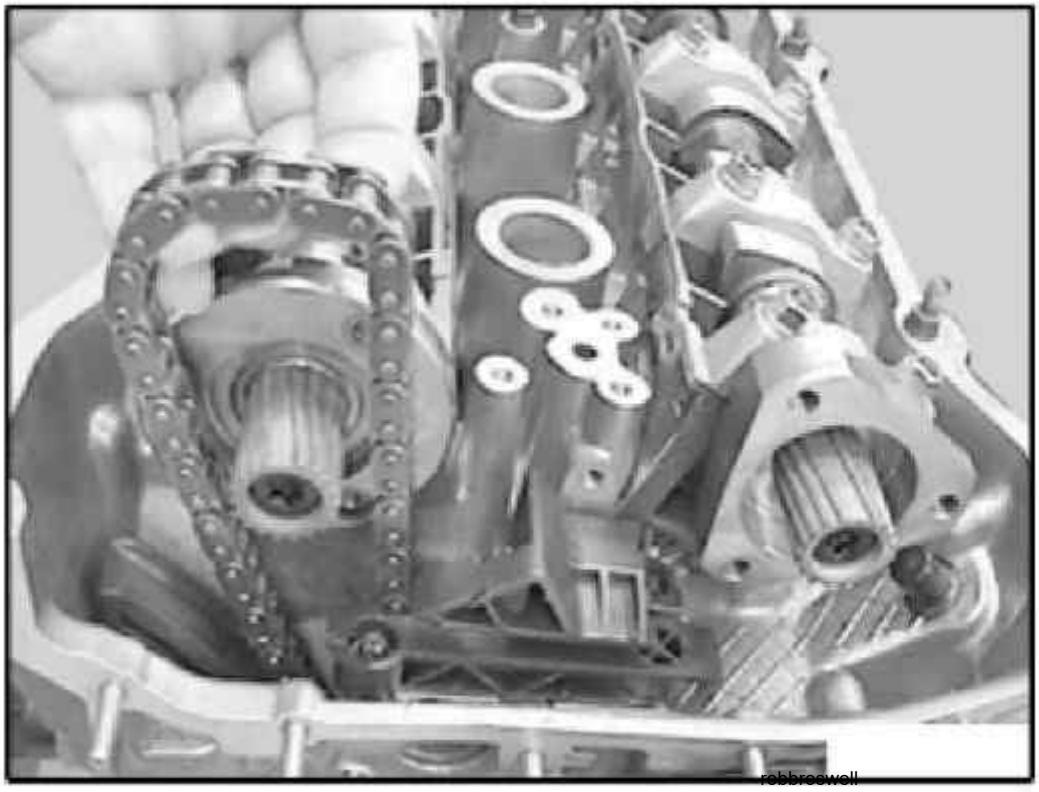


Fig. 176: Lifting Timing Chain And Holding Under Tension
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Bearing cap 1 of inlet camshaft is centered with adapter sleeves. To prevent inlet camshaft from tilting in bearing strip, release nuts and remove bearing cap 1.

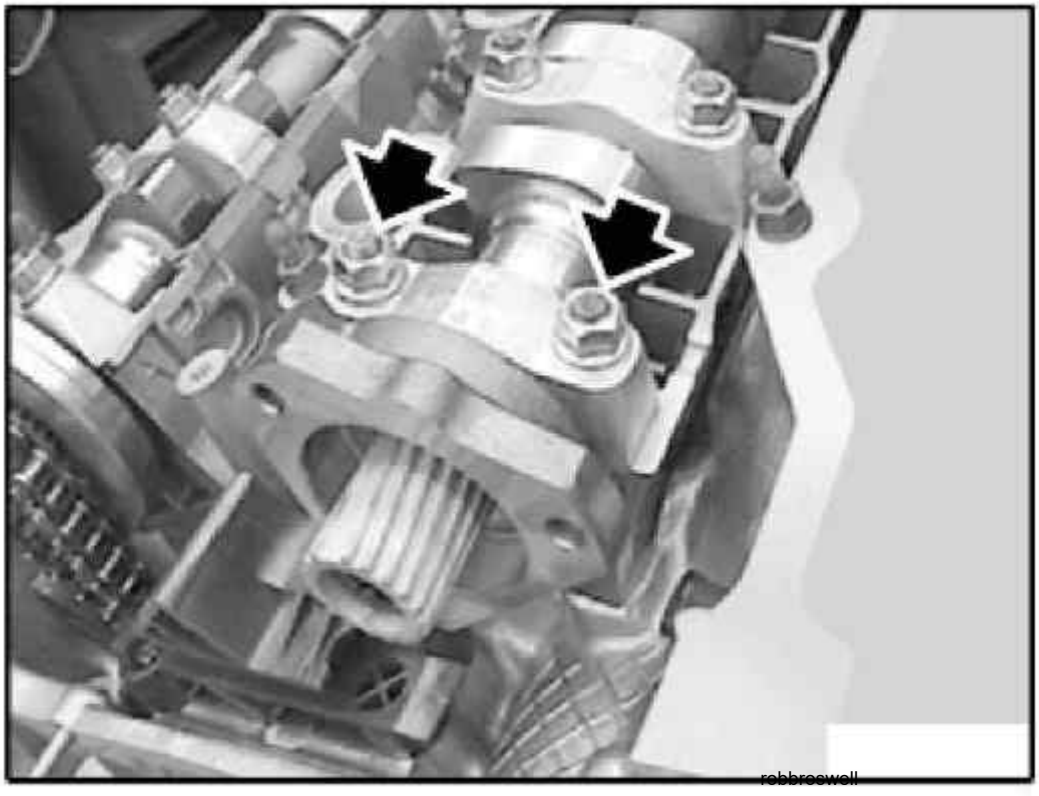


Fig. 177: Installing Bearing Cap Of Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 260 to cylinder head and screw into spark plug threads in cylinders 1 and 4.

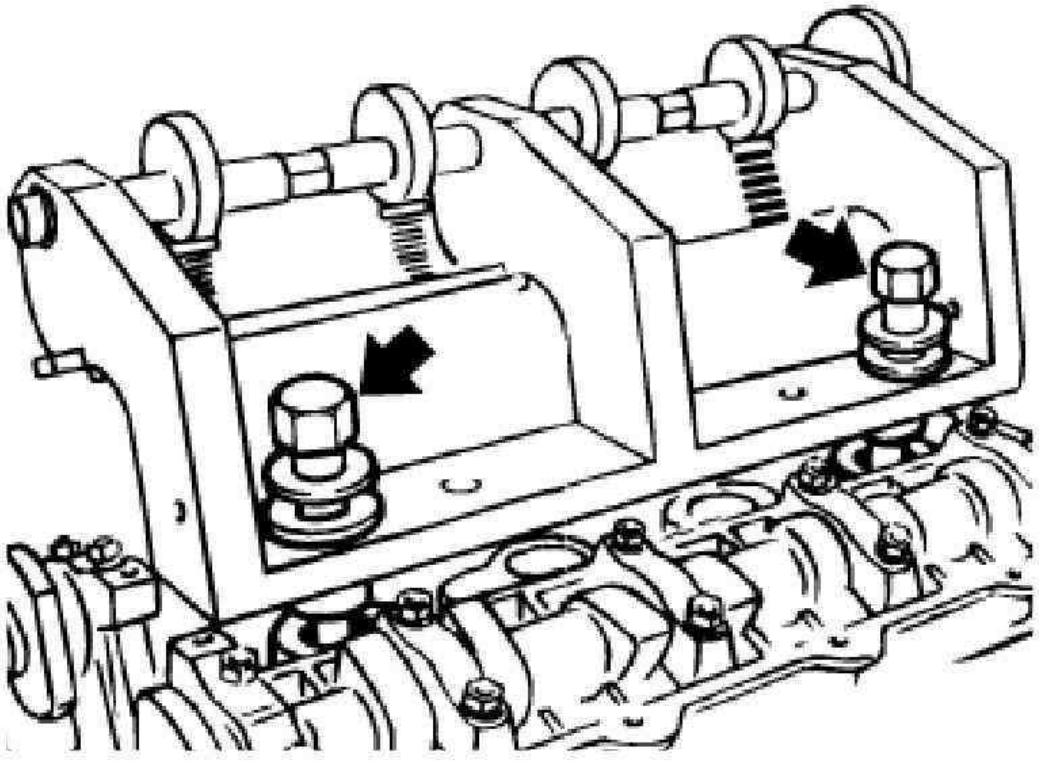
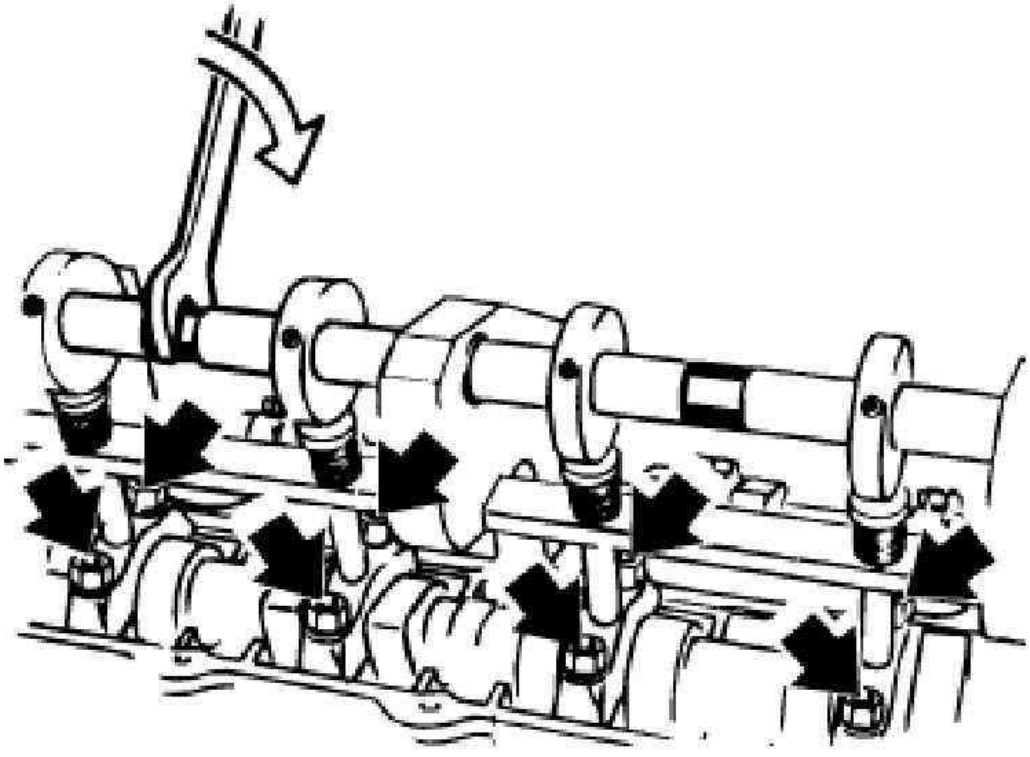


Fig. 178: Fitting Special Tool To Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Turn the eccentric shaft to tension the bearing caps.

Unfasten nuts on bearing cover.

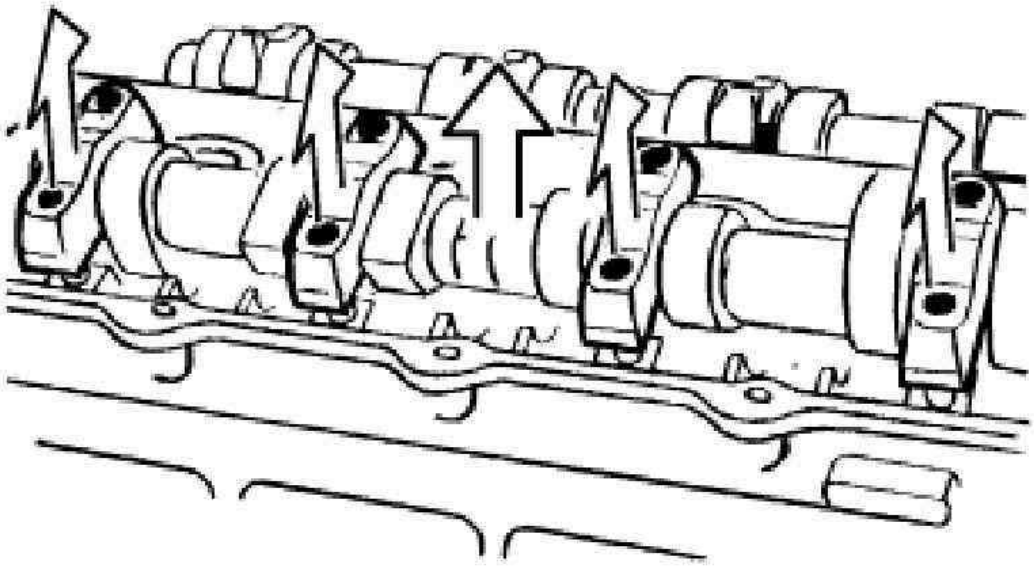


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Fig. 179: Turning Eccentric Shaft To Tension Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

Relieve tension on eccentric shaft and remove special tool 11 3 260.

Remove bearing covers and place to one side in orderly fashion. Remove camshaft.



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Fig. 180: Removing Bearing Covers And Place
Courtesy of BMW OF NORTH AMERICA, INC. robbroswell

NOTE: If the cylinder head is then to be removed, remove complete bearing strip with bucket tappets.

Locate bucket tappets in bearing strip with special tool 11 3 250.

Lift out complete bearing strip with bucket tappet.

NOTE: Only re-use used bucket tappets in the same tappet bore.

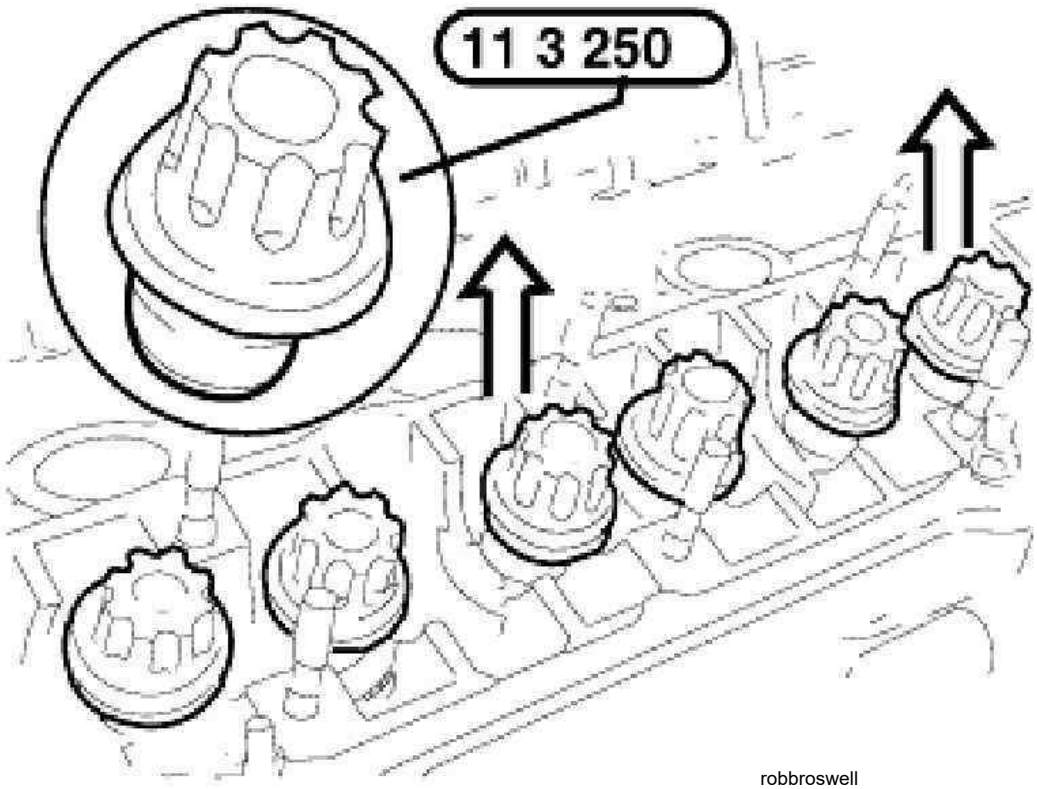


Fig. 181: Removing Bucket Tappets
Courtesy of BMW OF NORTH AMERICA, INC.

Check bearing points on bucket tappets for signs of wear (scoring).

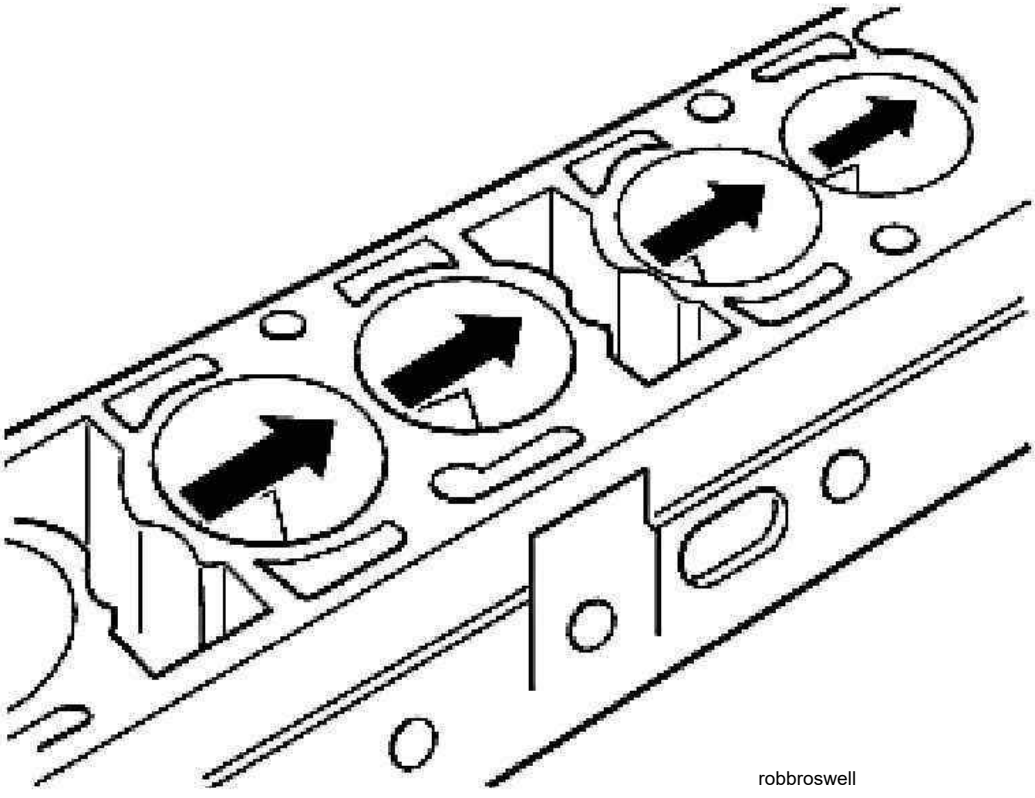


Fig. 182: Checking Bearing Points On Bucket Tappets
Courtesy of BMW OF NORTH AMERICA, INC.

Bearing strips are marked "A" for exhaust side and "E" for inlet side.

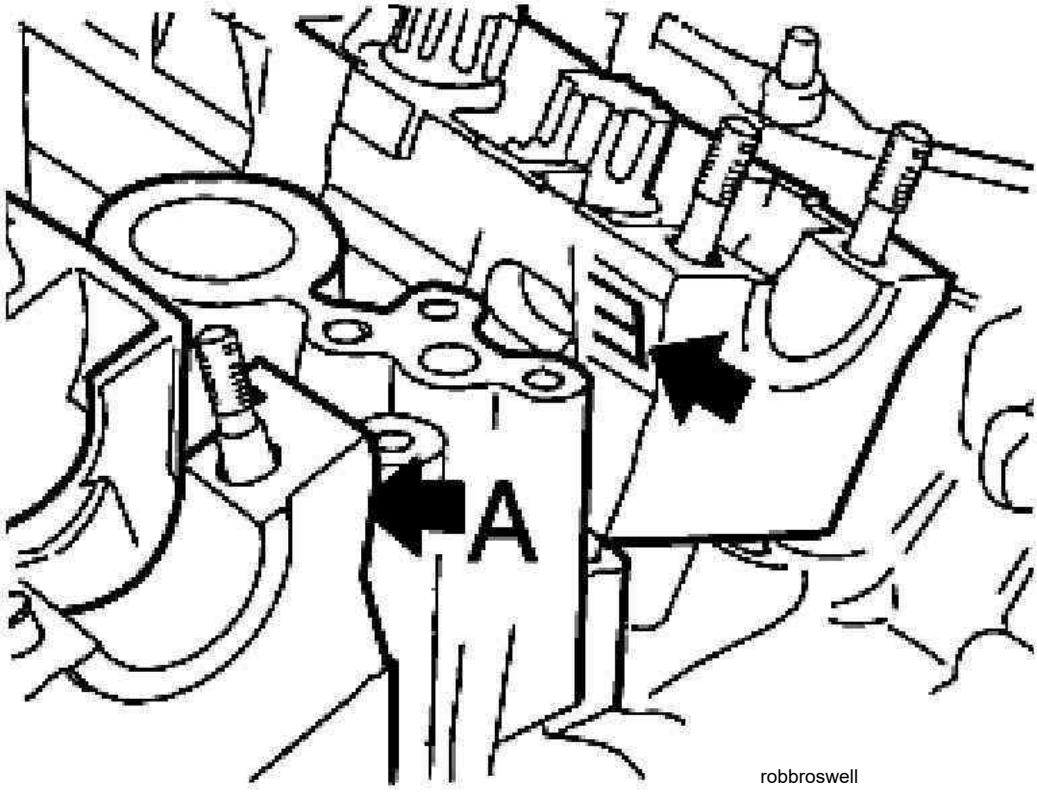


Fig. 183: Identifying Bearing Strips Mark For Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Note centering dowels on retaining pins at bearing points 2 and 7.

Install bearing strips.

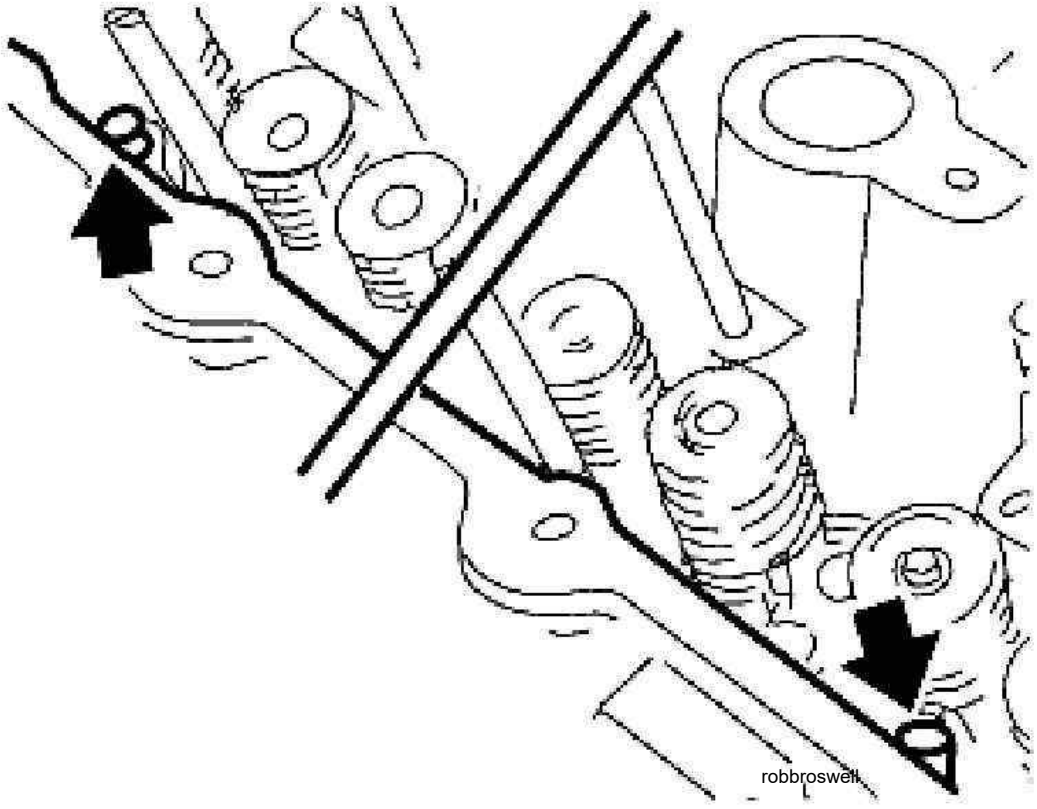


Fig. 184: Installing Bearing Strips
Courtesy of BMW OF NORTH AMERICA, INC.

Installation

Installation of camshafts is described separately from removal.

The assembly sequence for removal and installation is different.

NOTE: Camshafts, bearings and bearing caps, friction washers, all splines on toothed shafts and spline hubs must be oiled before installation.

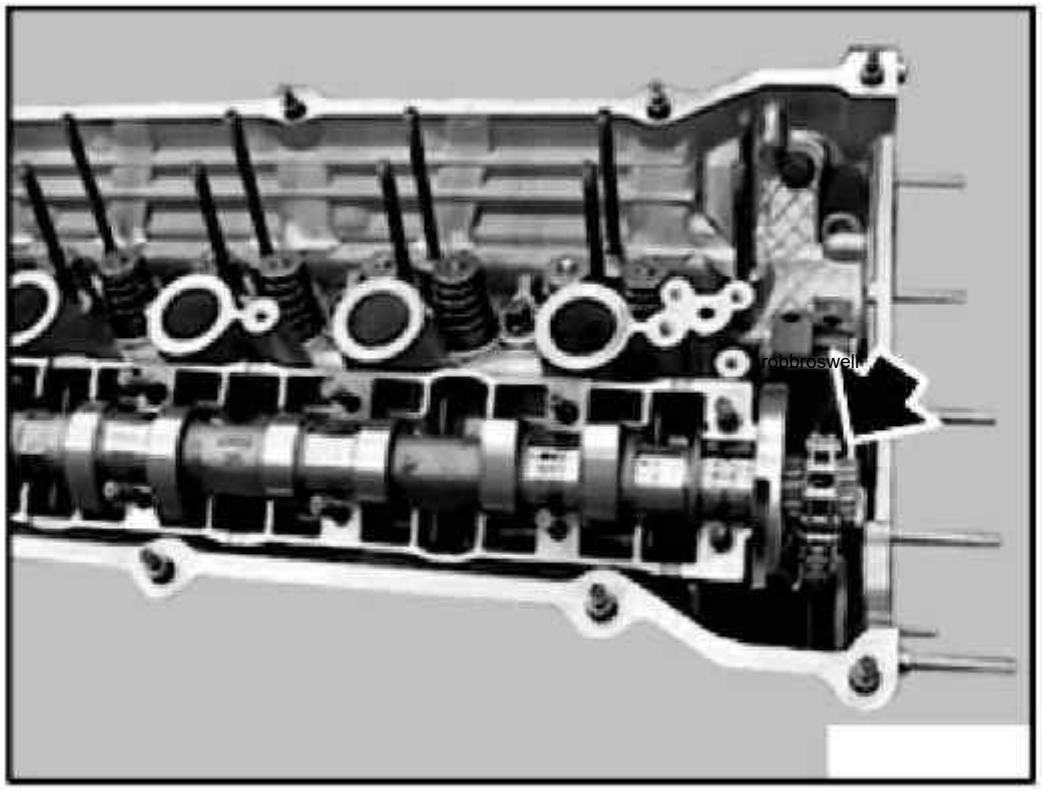
IMPORTANT: The bucket tappets expand when not subjected to load by the camshaft and therefore require some time before they can be pushed back down. During a rapid assembly sequence, the "closed" valves may still be open and be in contact with the piston.

Comply with following waiting periods after installing camshaft and before cranking engine back to TDC position.

- Room temperature (20°C) 4 mins
- 10°C... 20°C 11 mins
- 0°C... 10°C 30 mins

Pull up timing chain and feed in exhaust camshaft.

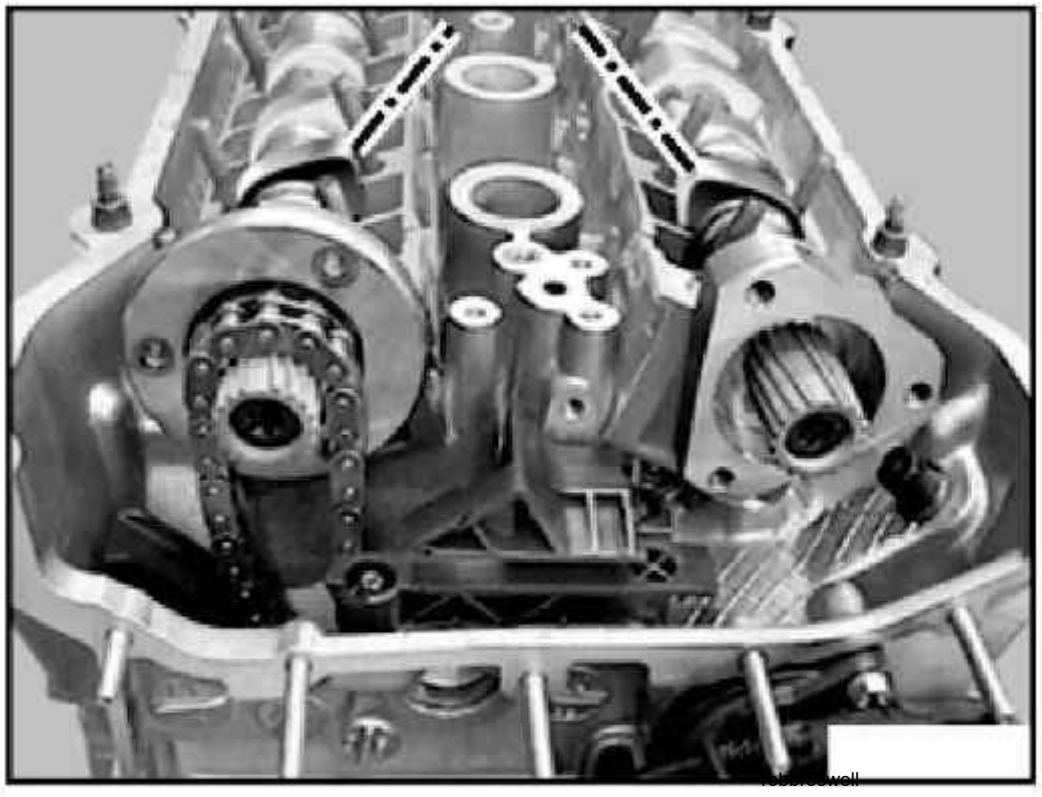
Position timing chain on exhaust camshaft.



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Fig. 185: Pulling Up Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Install camshafts so that cam tips on inlet and exhaust valves on 1st cylinder face one another.



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Fig. 186: Identifying Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Fit bearing cover.

NOTE: **Bearing caps are marked from exhaust side:**
A1... A7 for exhaust side
E1... E7 for inlet side

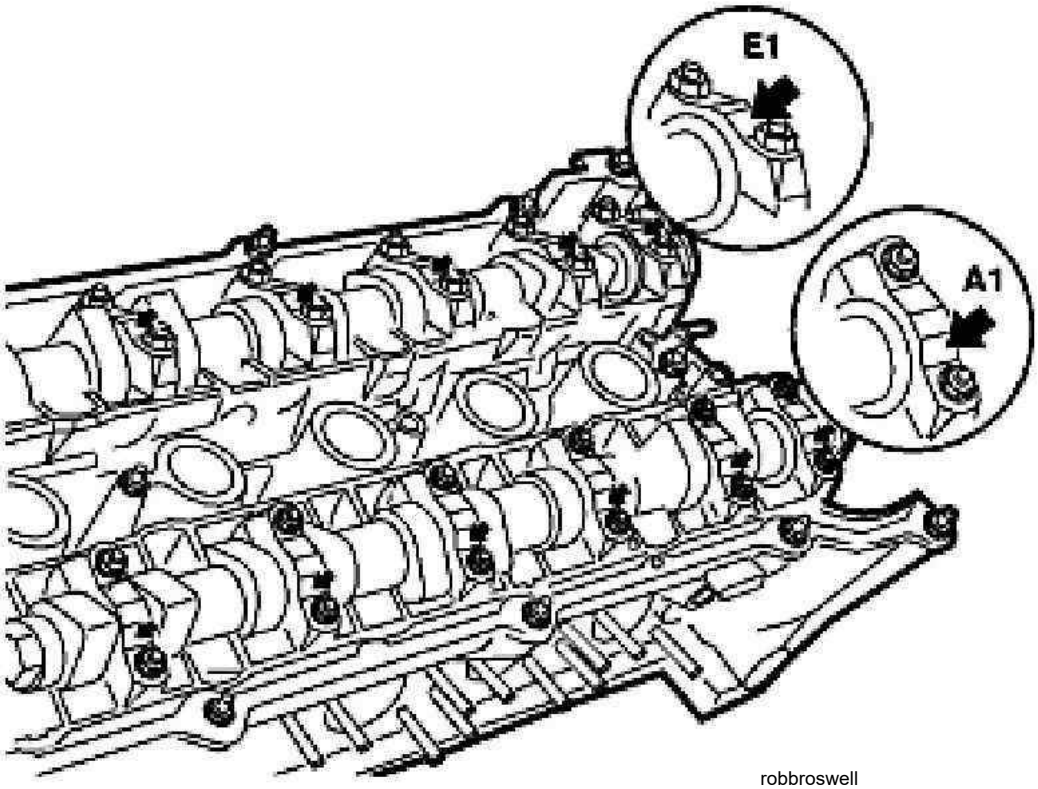


Fig. 187: Identifying Bearing Caps Mark
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 260 to cylinder head and screw into spark plug threads in cylinders 1 and 4.

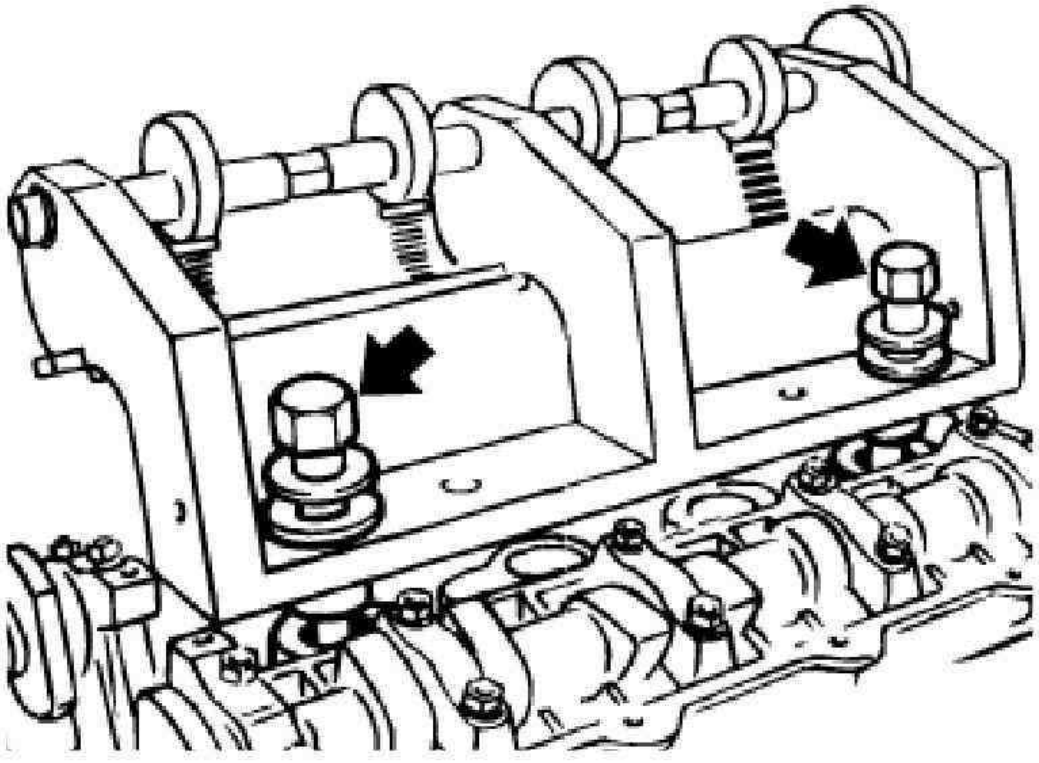


Fig. 188: Fitting Special Tool To Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Turn the eccentric shaft to tension the bearing caps.

Tighten down bearing cover.

Tightening torque, see 11 31 1AZ in **ENGINE - TIGHTENING TORQUES** .

Remove special tool 11 3 260.

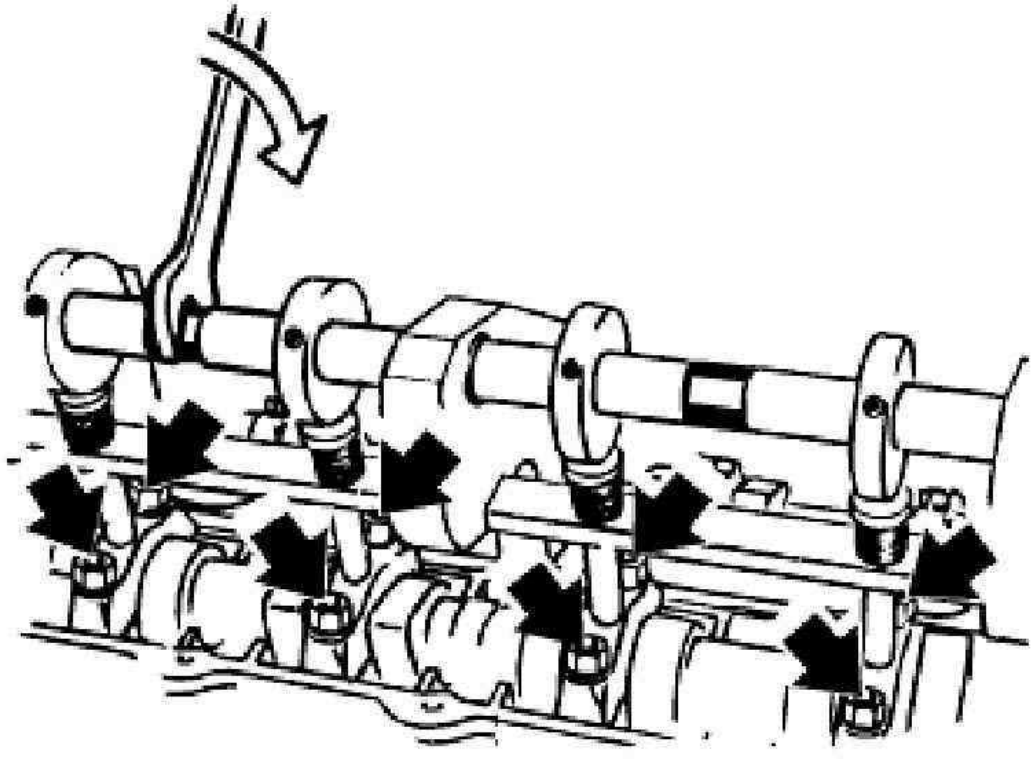


Fig. 189: Turning Eccentric Shaft To Tension Bearing Caps
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not damage the cylinder head.
If necessary, machine open-end wrench accordingly.

Align camshafts with open-end wrench.

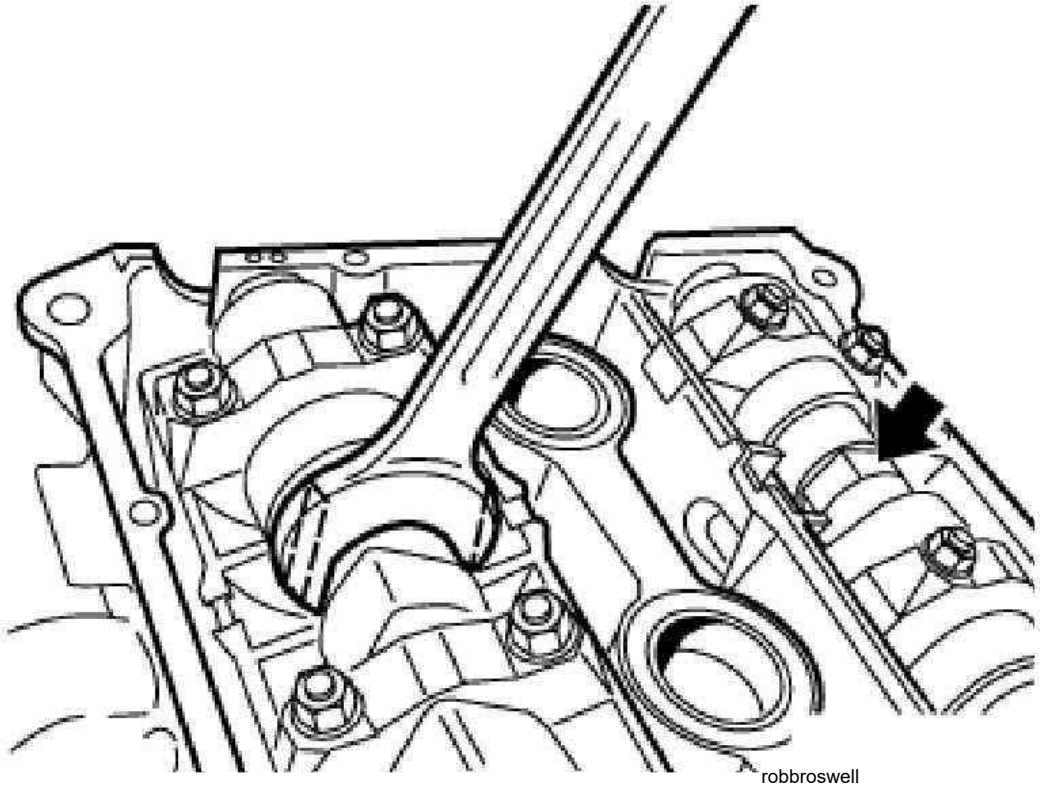


Fig. 190: Aligning Camshafts With Open-End Wrench
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 240 to camshafts on cylinder 6. Align camshafts so that special tool 11 3 240 rests without gaps on cylinder head.

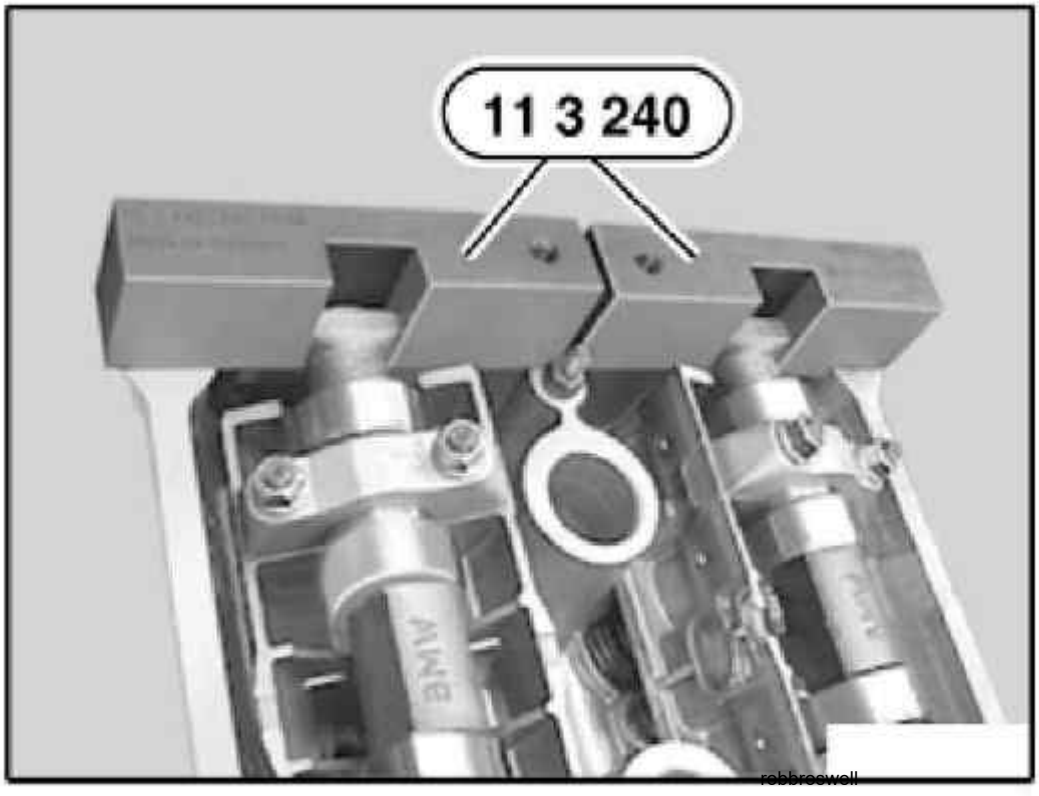


Fig. 191: Fitting Special Tool To Camshafts On Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 3 244 to special tool 11 3 240 and locate by way of spark plug thread.

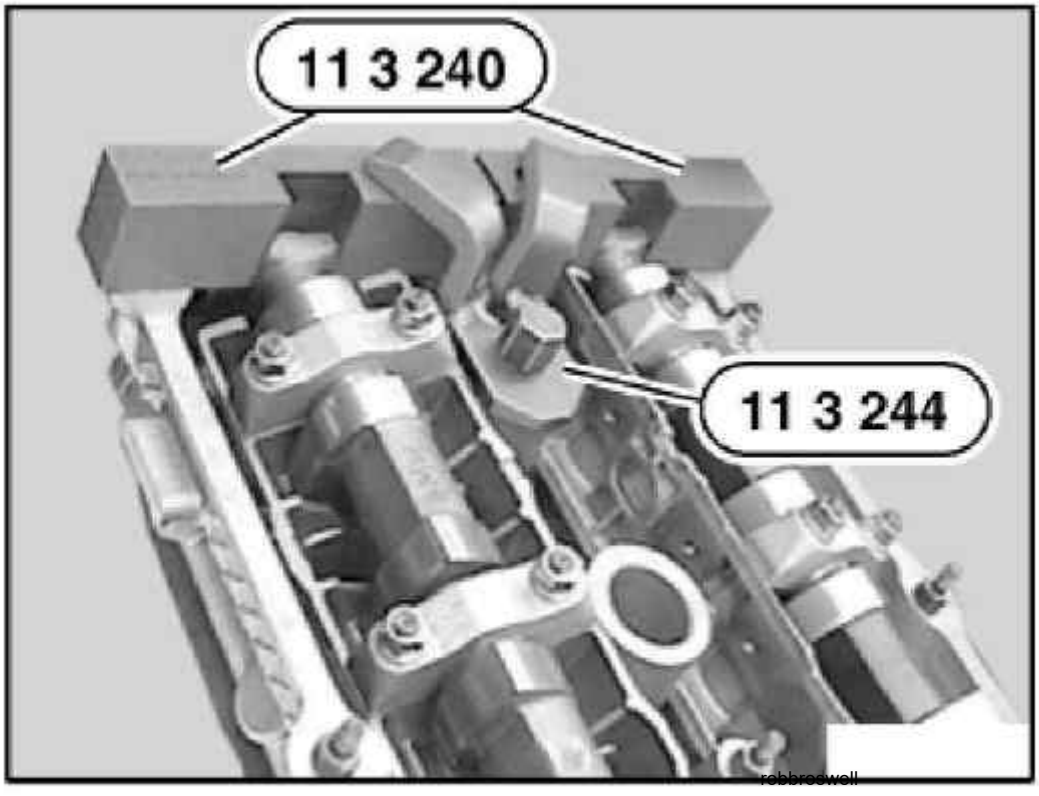


Fig. 192: Attaching Special Tool To Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Lift timing chain and hold under tension.

Turn engine from 30° before TDC position in direction of rotation as far as TDC position.

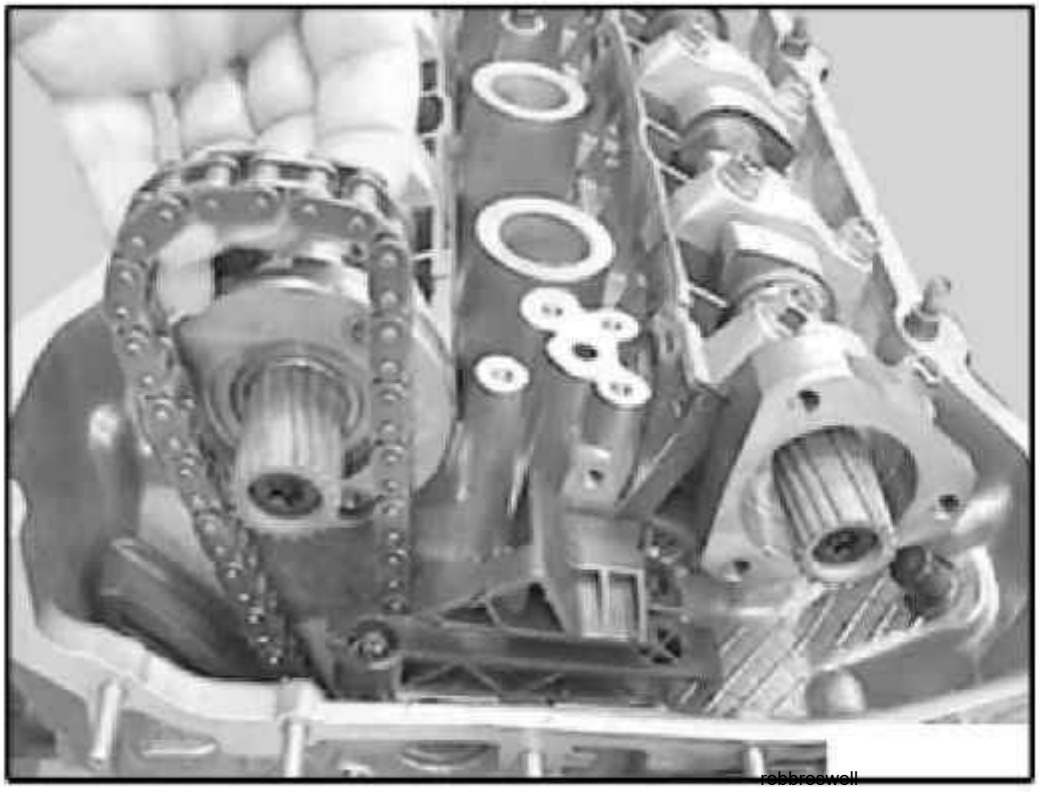


Fig. 193: Lifting Timing Chain And Holding Under Tension
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300.

IMPORTANT: Remove special tool 11 2 300 before starting engine.

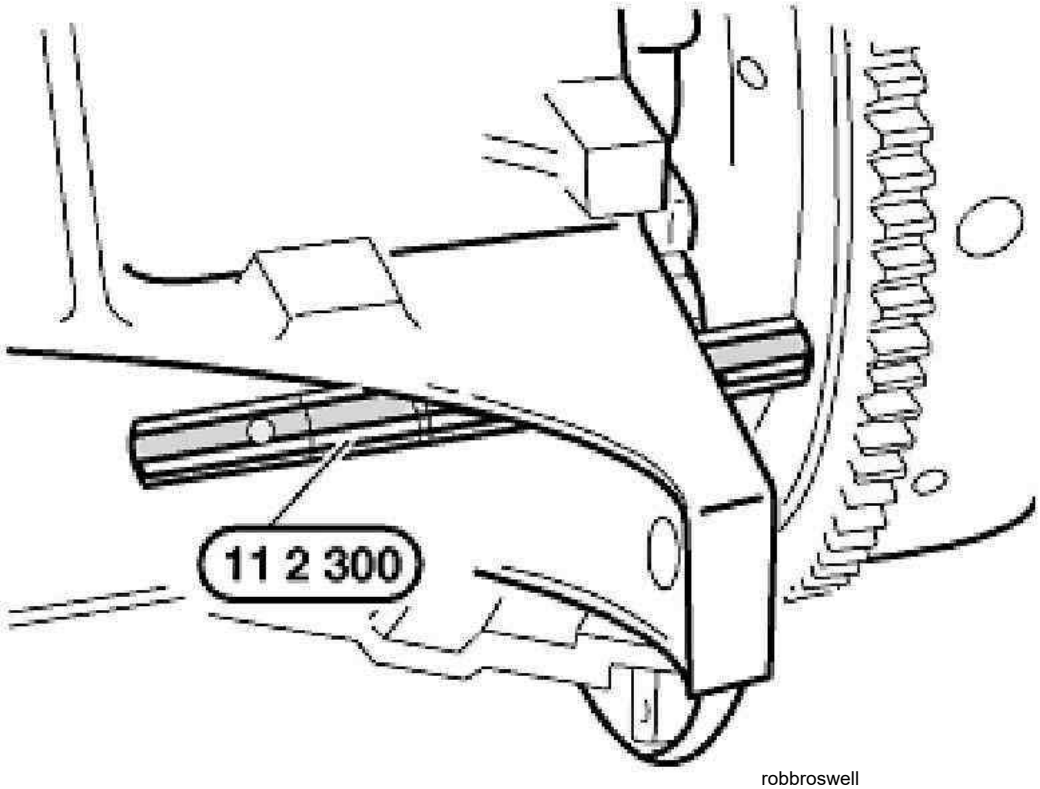


Fig. 194: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmissions only:

Illustration does not show automatic transmission.

IMPORTANT: On engines with automatic transmissions, there is shortly before the special tool bore (1) a large bore (2) which can be confused with the special tool bore.

If special tool 11 2 300 is secured in the correct bore (1), the engine can no longer be cranked at the central bolt.

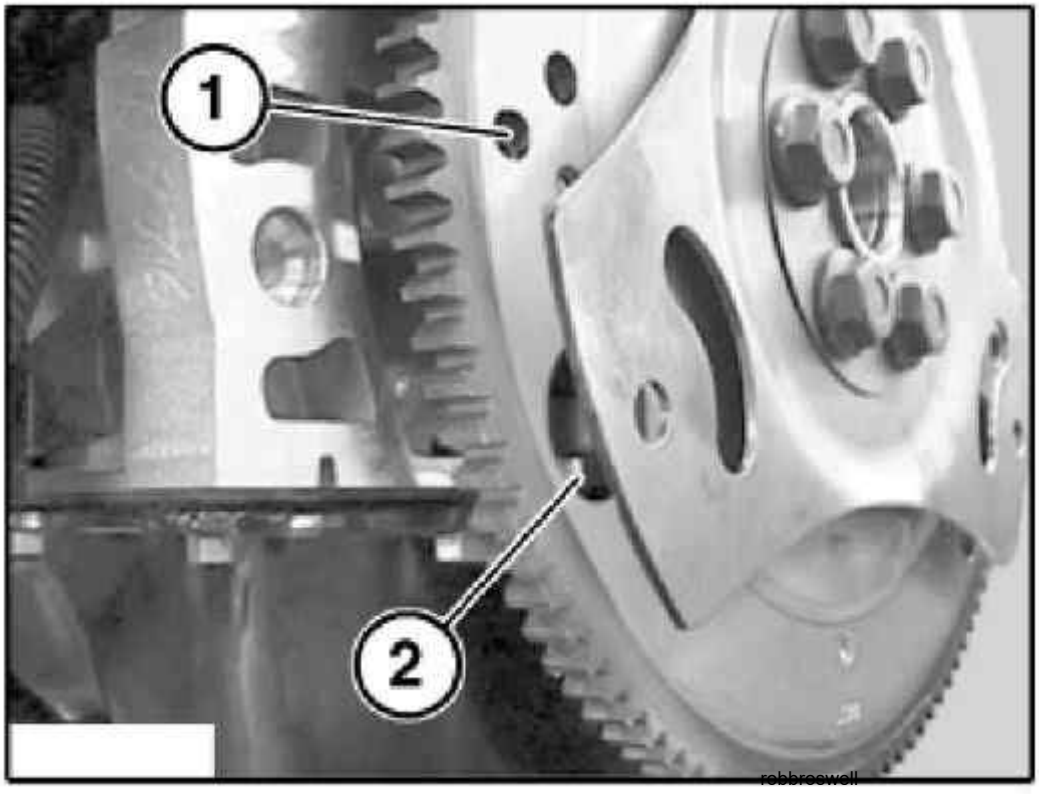


Fig. 195: Identifying Special Tool Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Position sensor gear on inlet camshaft.

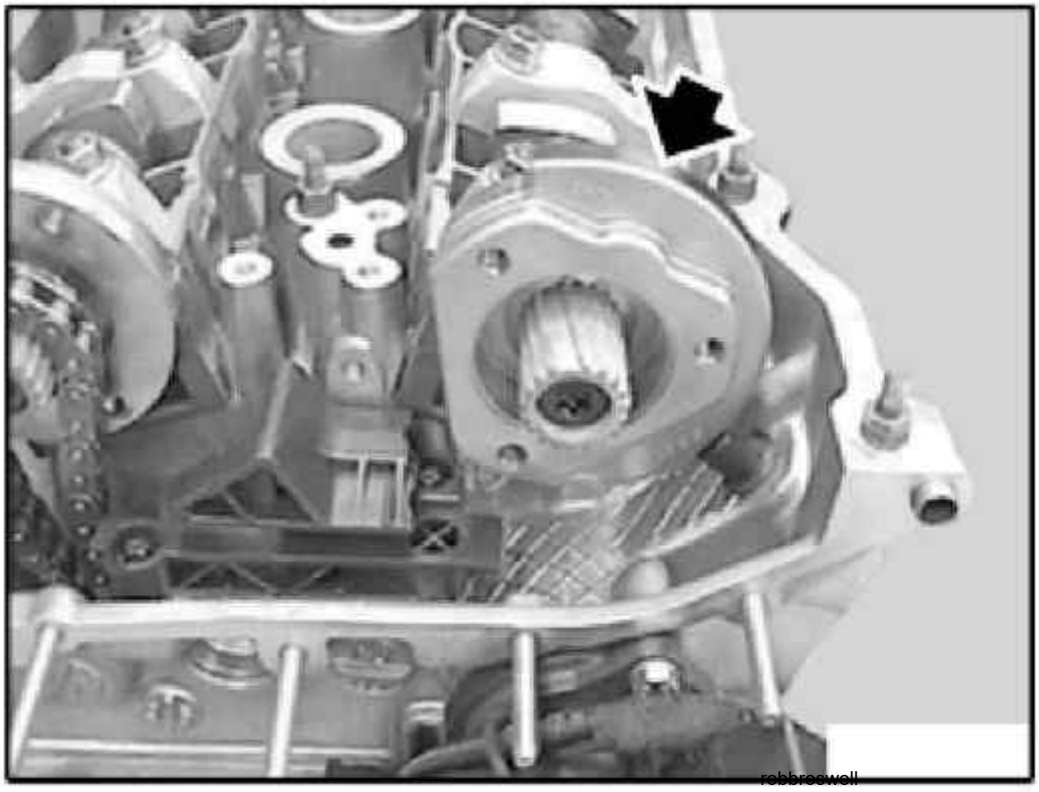


Fig. 196: Positioning Sensor Gear On Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Fit thrust washer and tighten down with dowels.

Tightening torque, see 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .

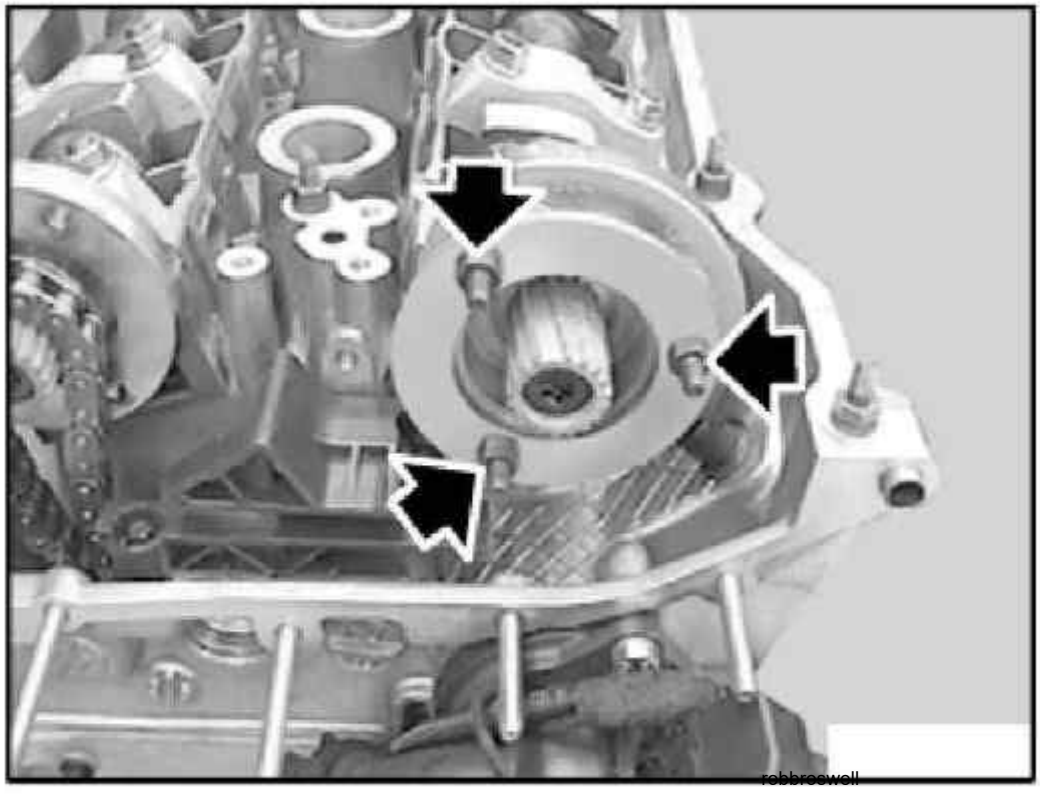
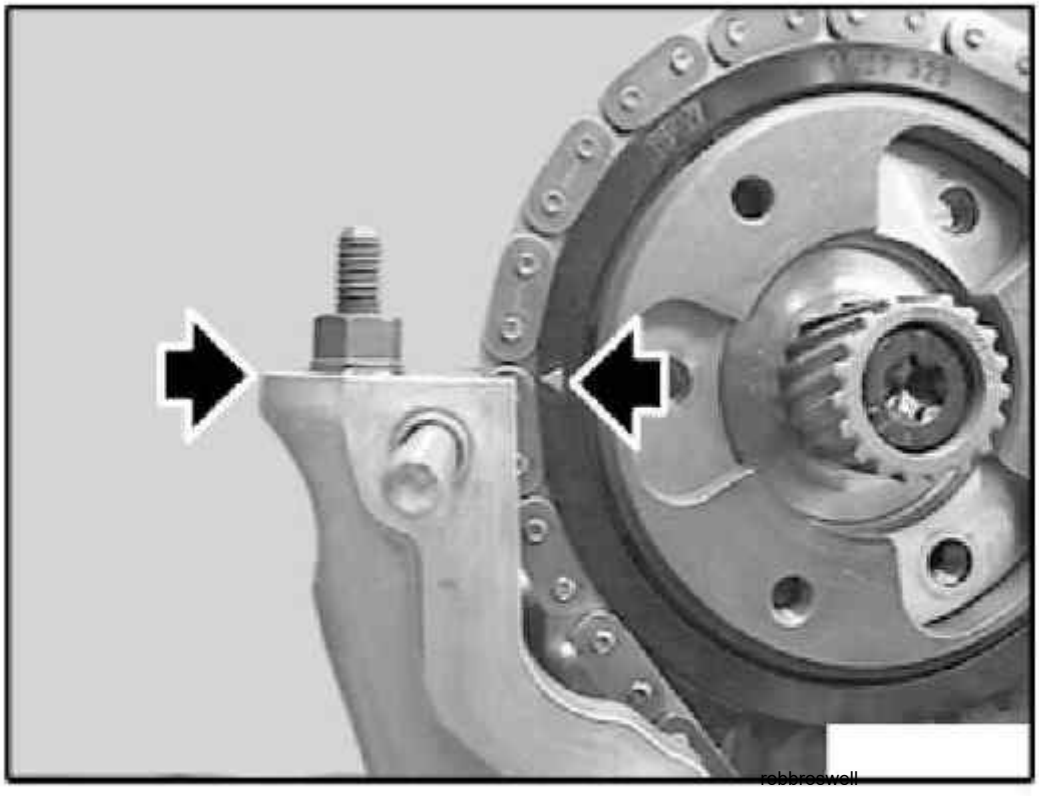


Fig. 197: Fitting Thrust Washer And Tightening Down With Dowels
Courtesy of BMW OF NORTH AMERICA, INC.

Feed chain wheel onto timing chain so that arrow on chain wheel faces separating face of upper side of cylinder head.



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Fig. 198: Installing Feed Chain Wheel Onto Timing Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 220 in cylinder head and bring adjustment screw into contact with tensioning rail, but do not pretension timing chain yet.

Check arrow on chain wheel to separating face of upper side of cylinder head, reposition chain wheel if necessary.

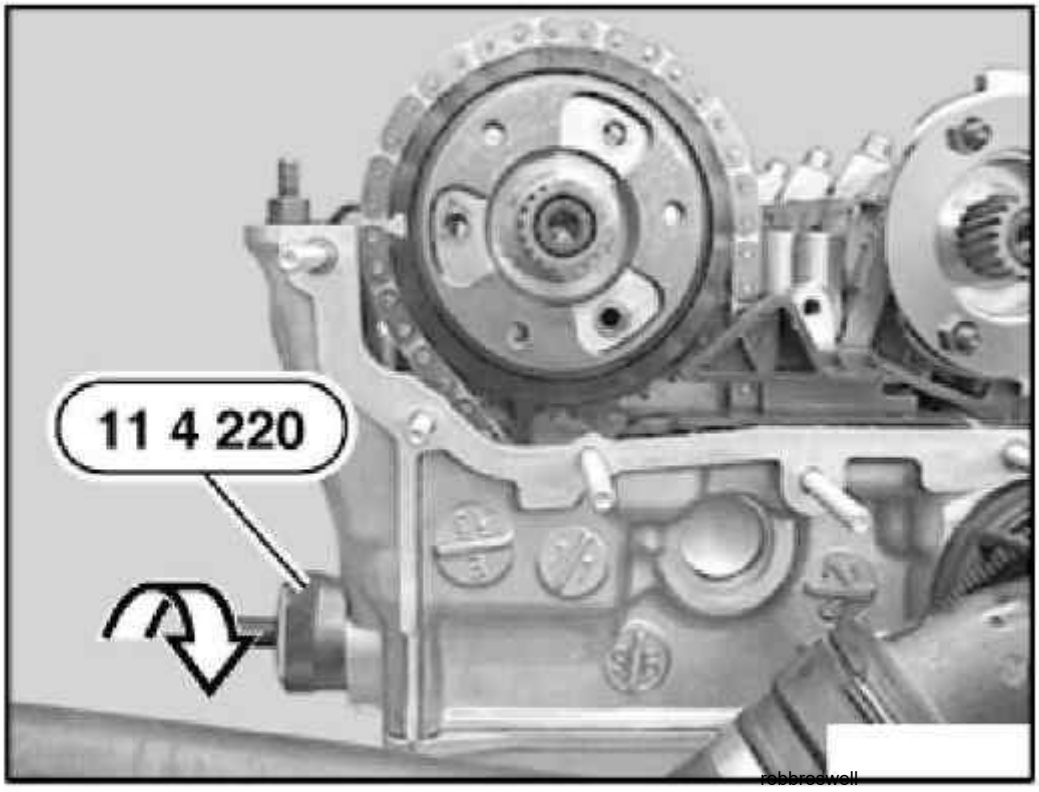


Fig. 199: Inserting Special Tool In Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Insert and tighten down screw-in pin.

Tightening torque, see 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .

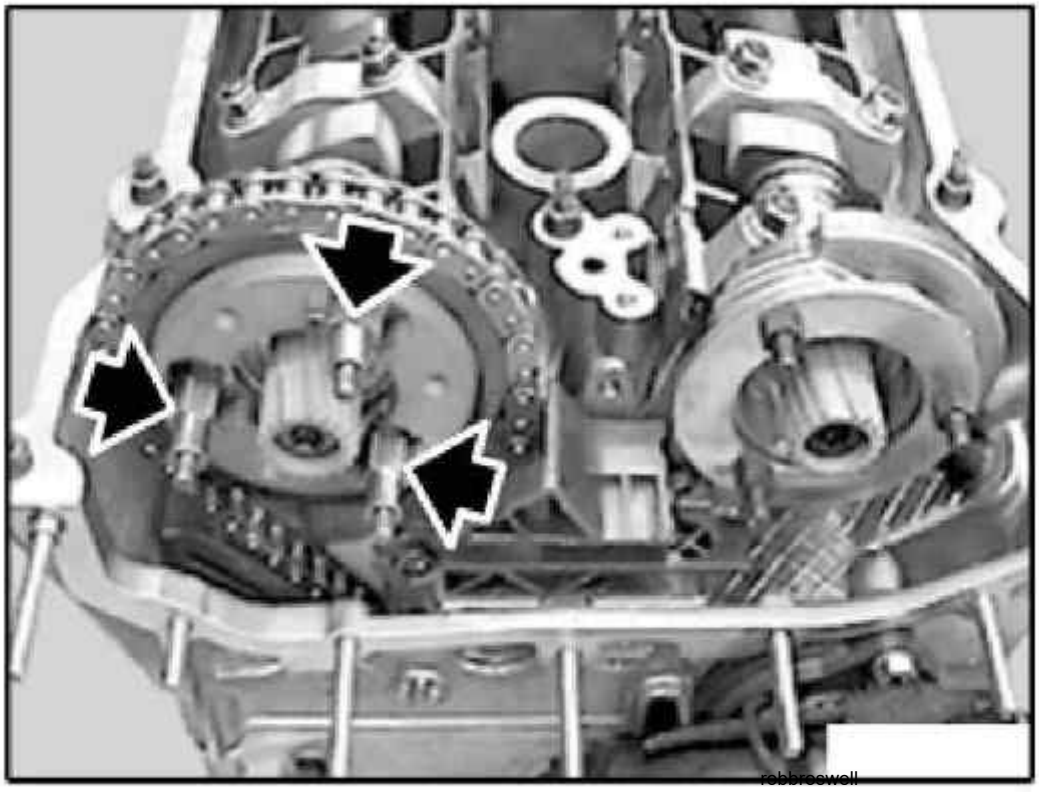


Fig. 200: Tightening Down Screw-In Pin
Courtesy of BMW OF NORTH AMERICA, INC.

Install secondary chain tensioner.

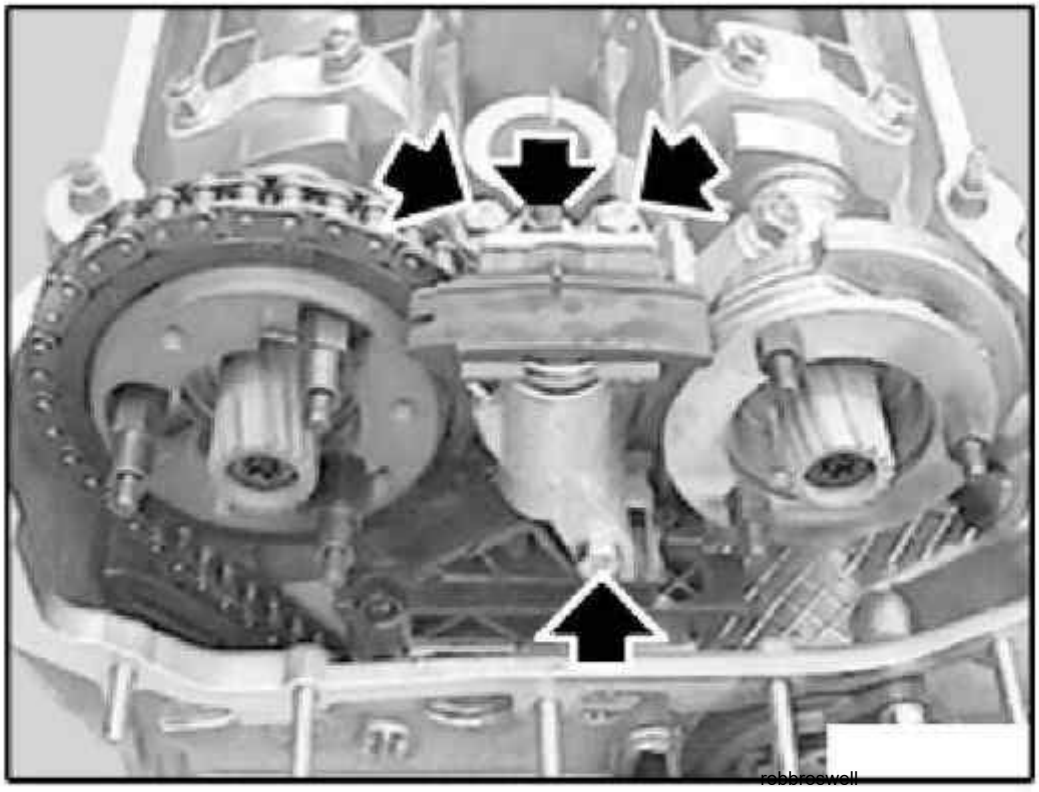


Fig. 201: Installing Secondary Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Fit toothed sleeve (6) and align to toothed shaft in camshaft so that tooth gaps are opposed.

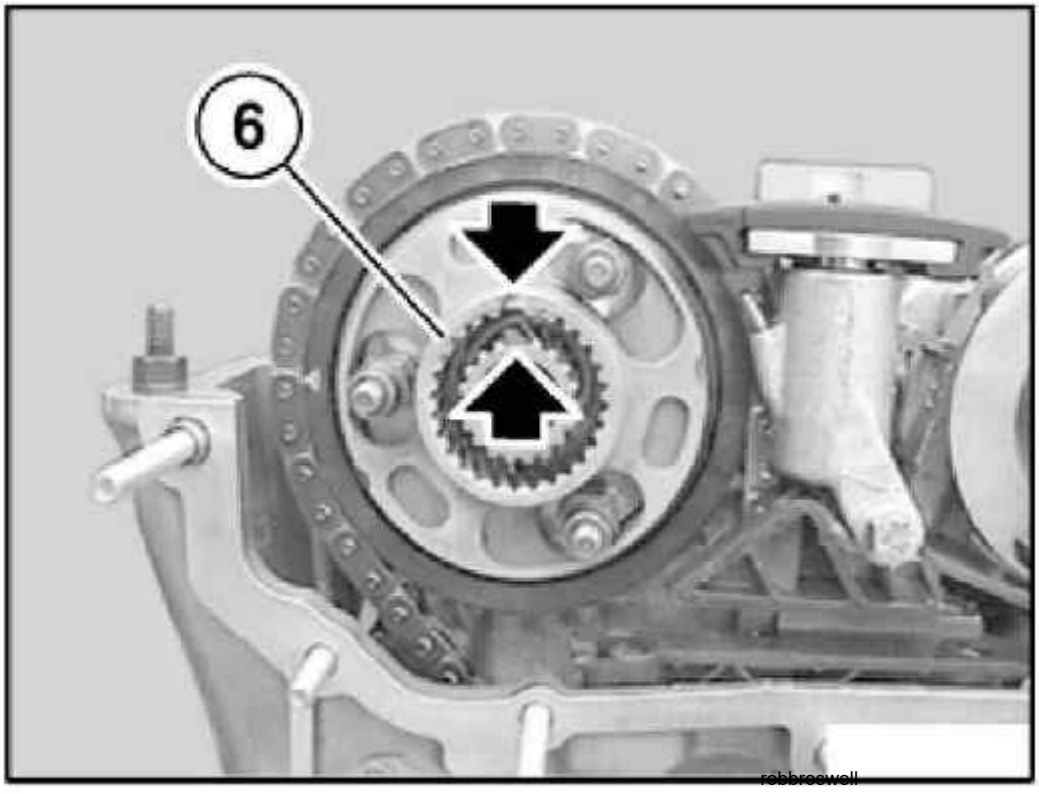
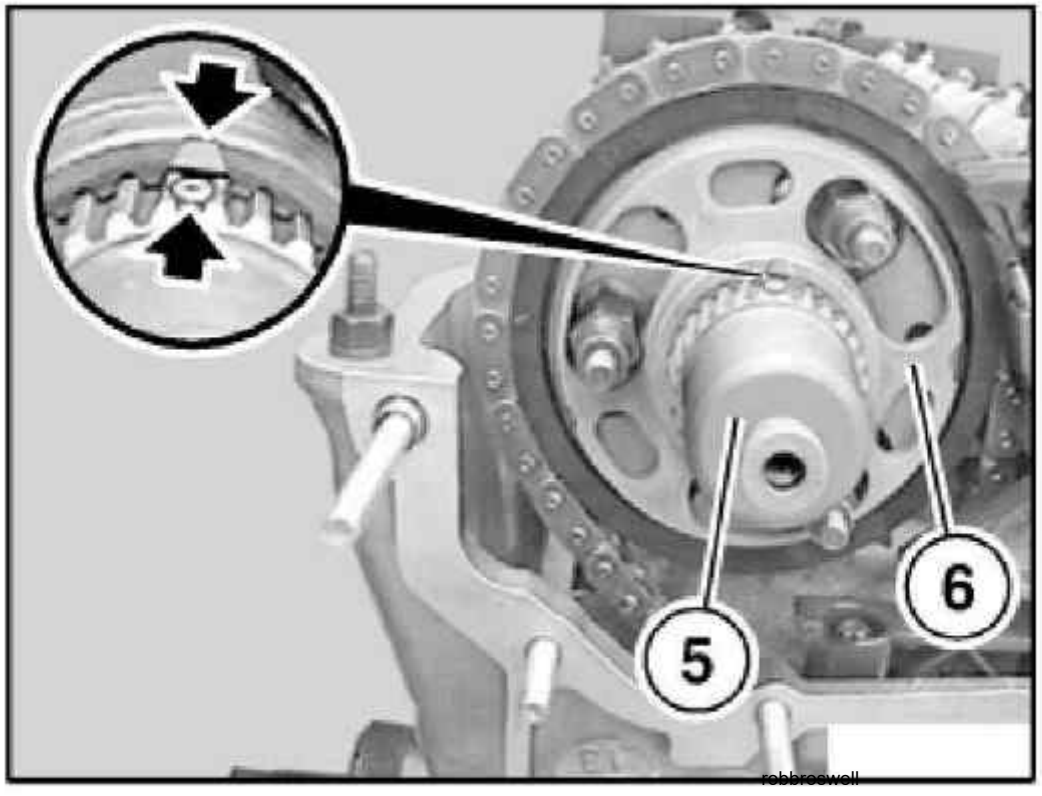


Fig. 202: Aligning Toothed Shaft In Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Secure toothed shaft (5).

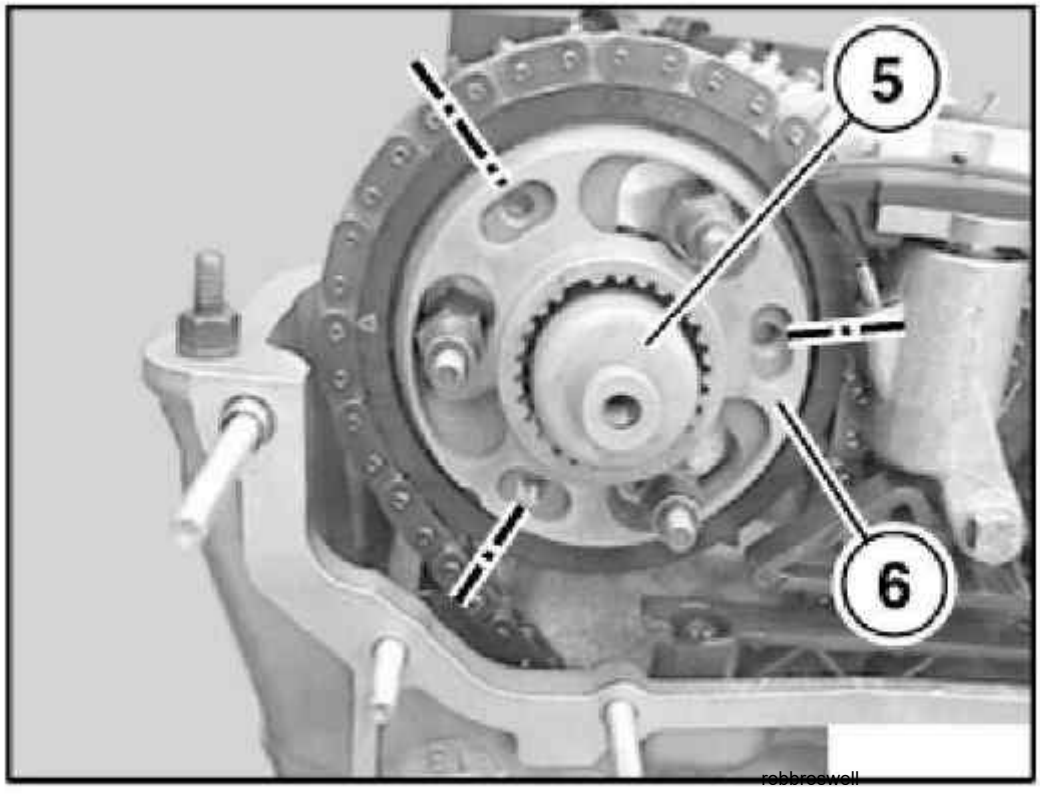
Insert pin of toothed shaft (5) into tooth gaps of splines on camshaft and toothed sleeve (6).



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Fig. 203: Inserting Pin Of Toothed Shaft Into Tooth Gaps Of Splines On Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Push in toothed shaft (5) until the longitudinal holes in the toothed sleeve (6) are positioned centrally with respect to the thread.



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Fig. 204: Pushing In Toothed Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Place chain wheels in special tool 11 6 180, position tooth gap on inlet chain wheel as shown in illustration and feed on chain.

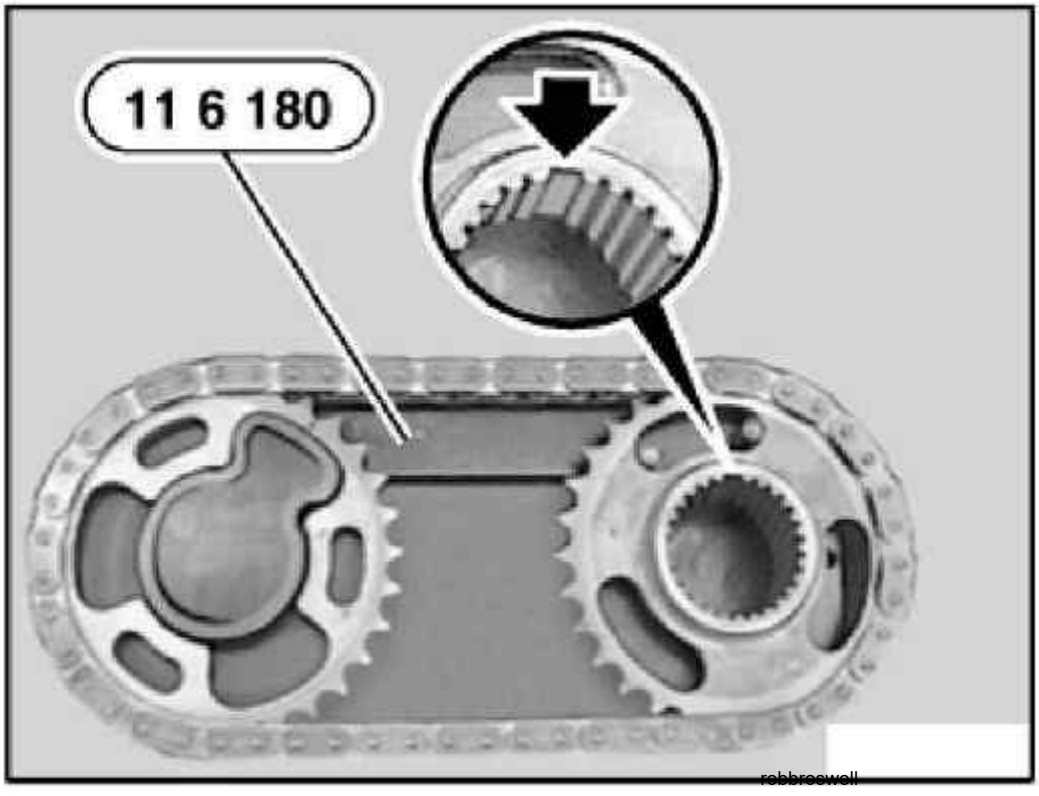
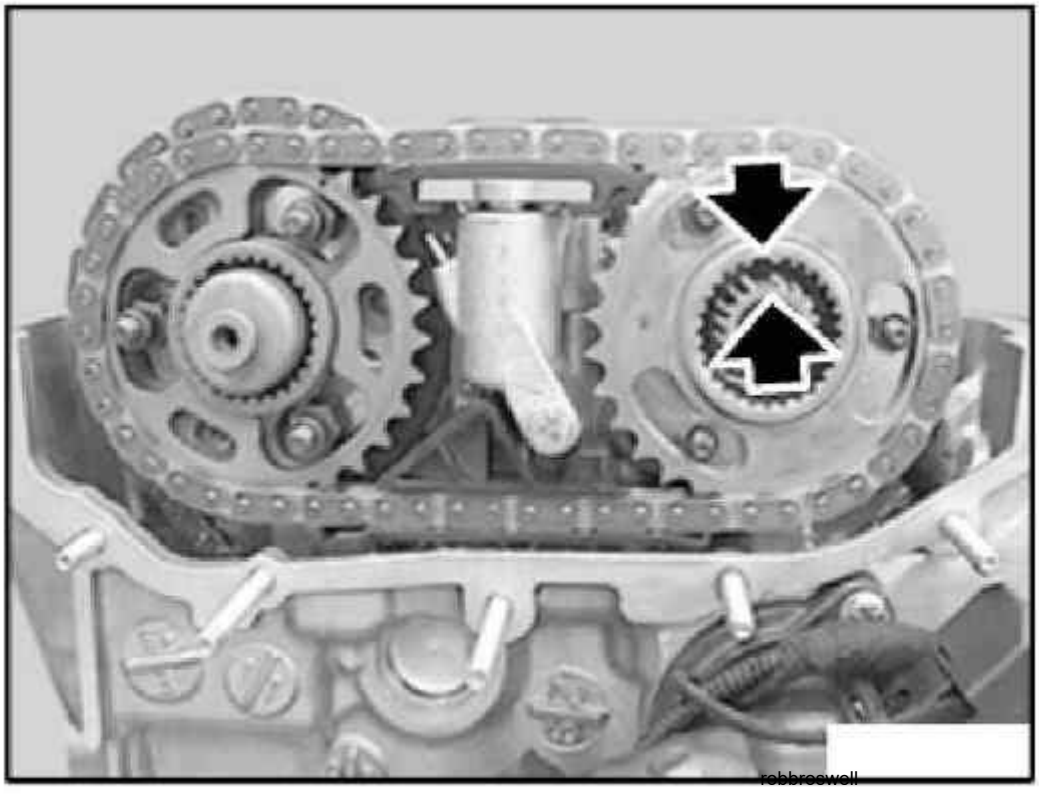


Fig. 205: Placing Chain Wheels In Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Do not alter position of chain wheels with respect to chain when removing from special tool 11 6 180.

Remove chain with sprocket wheels positioned from special tool 11 6 180 and so that tooth spaces oppose each other on inlet side.



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Fig. 206: Removing Chain With Sprocket Wheels
Courtesy of BMW OF NORTH AMERICA, INC.

Align chain with sprocket wheels so that tooth spaces are positioned exactly over each other on inlet side.

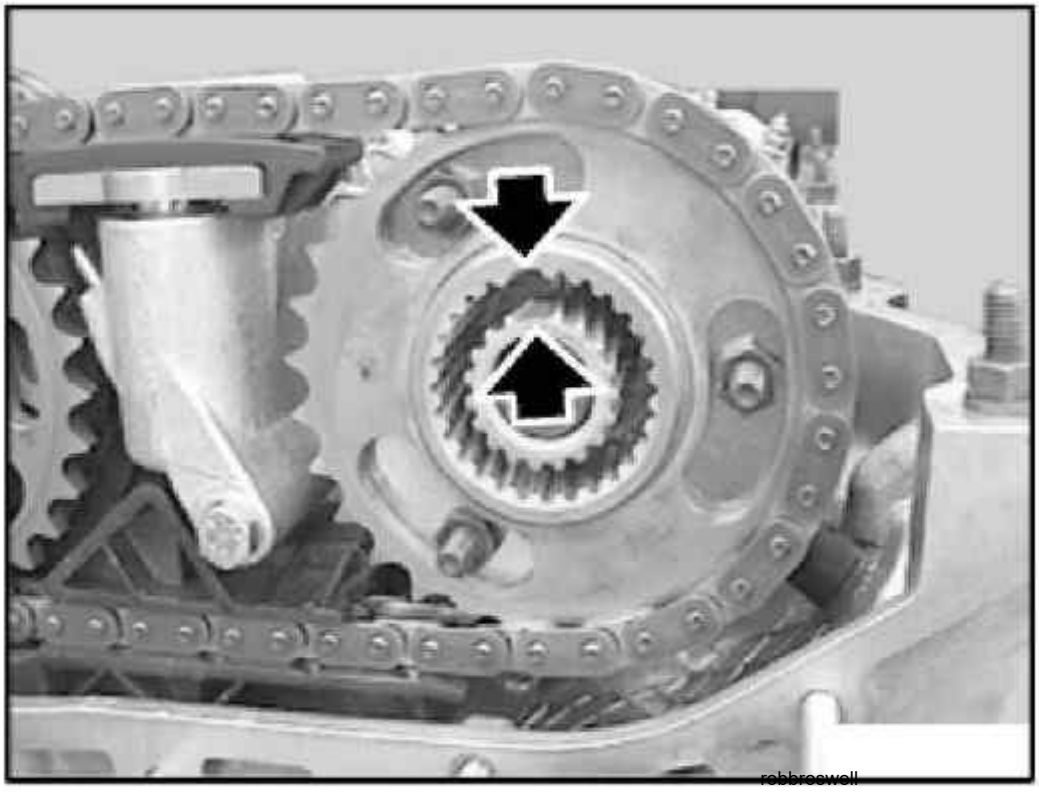


Fig. 207: Aligning Chain With Sprocket Wheels
Courtesy of BMW OF NORTH AMERICA, INC.

Secure toothed shaft (4).

Insert pin of toothed shaft (4) into tooth gaps of splines on camshaft and chain wheel.

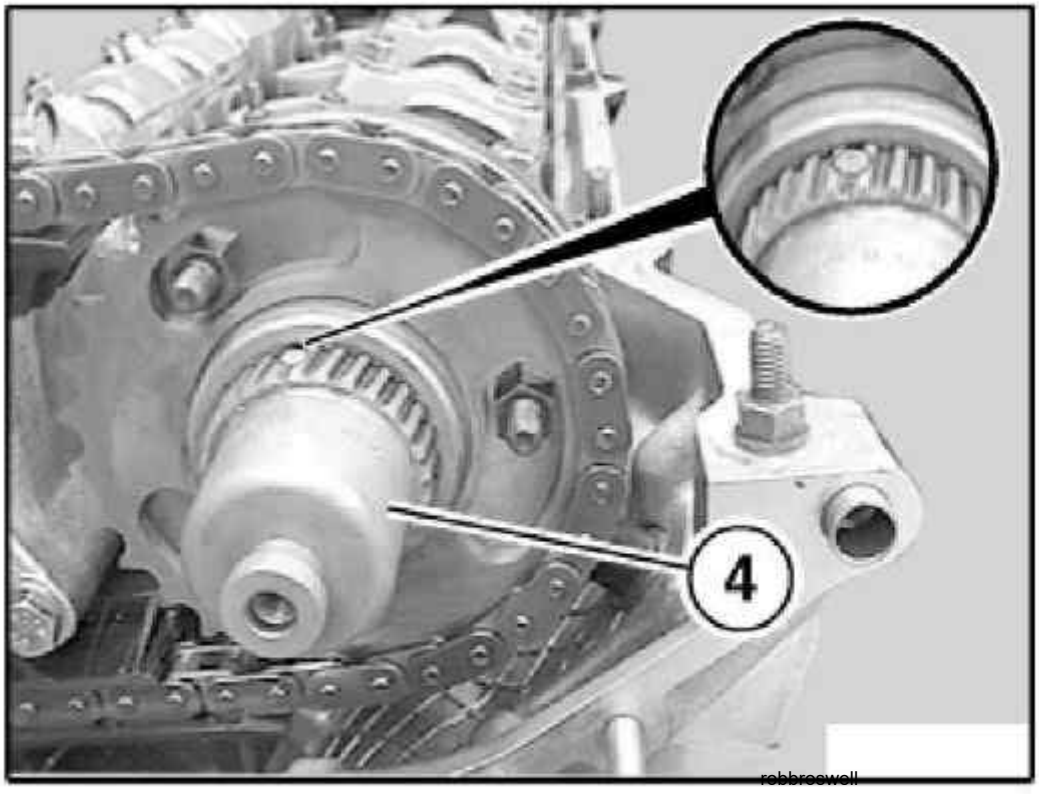
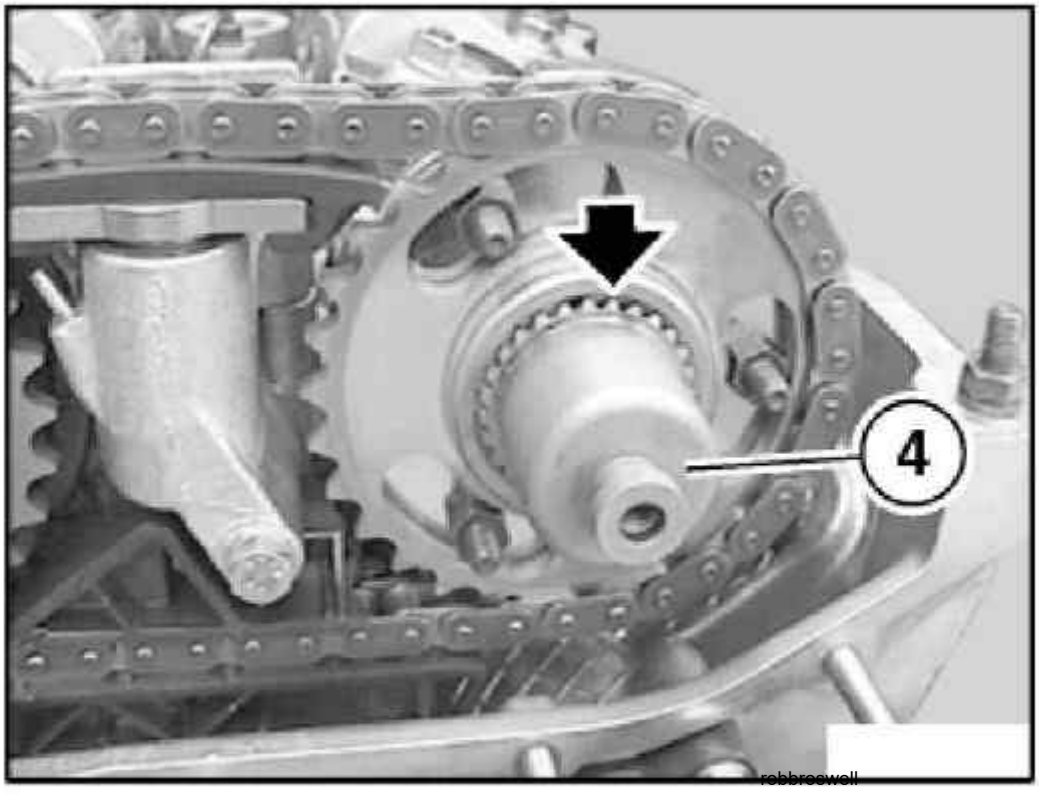


Fig. 208: Inserting Pin Of Toothed Shaft Into Tooth Gaps Of Splines On Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Push in toothed shaft (4) until approx. 1 mm of splines can still be seen.

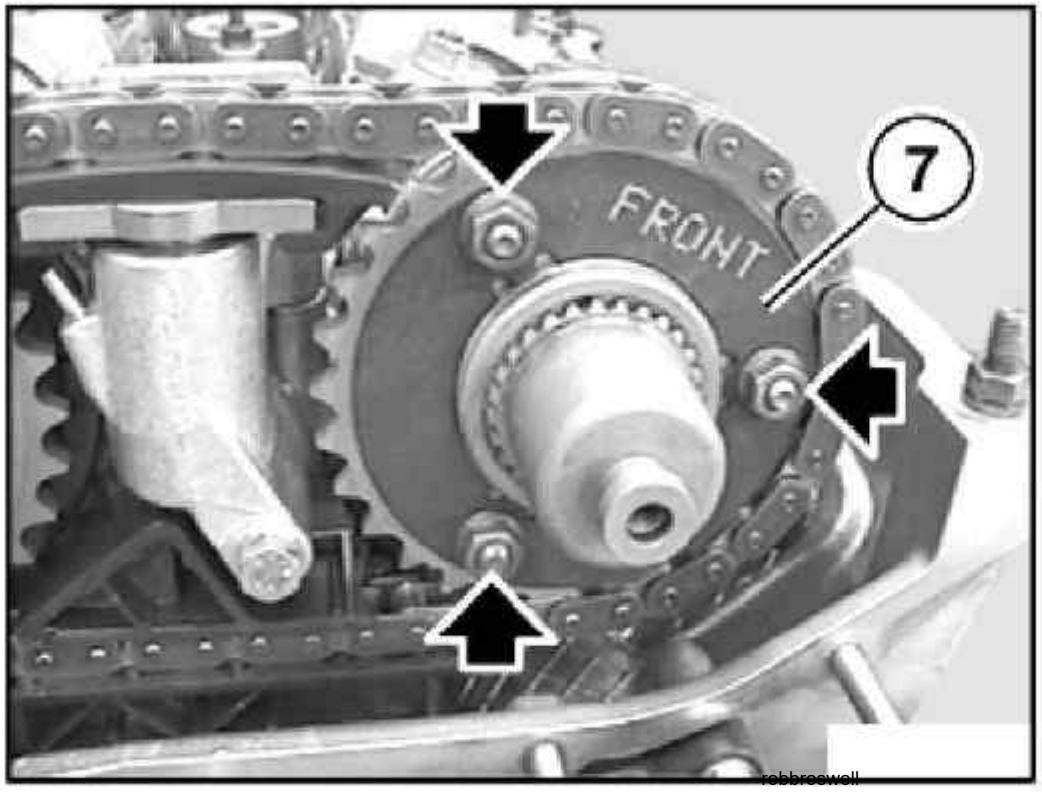


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Fig. 209: Pushing In Toothed Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Note installation direction of corrugated washer (7), "FRONT" lettering must be visible.

Install corrugated washer, tighten nuts by hand but do not tighten down fully yet.



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Fig. 210: Installing Corrugated Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws on exhaust side, initially tighten to approx. 5 Nm and then slacken off again half a turn.

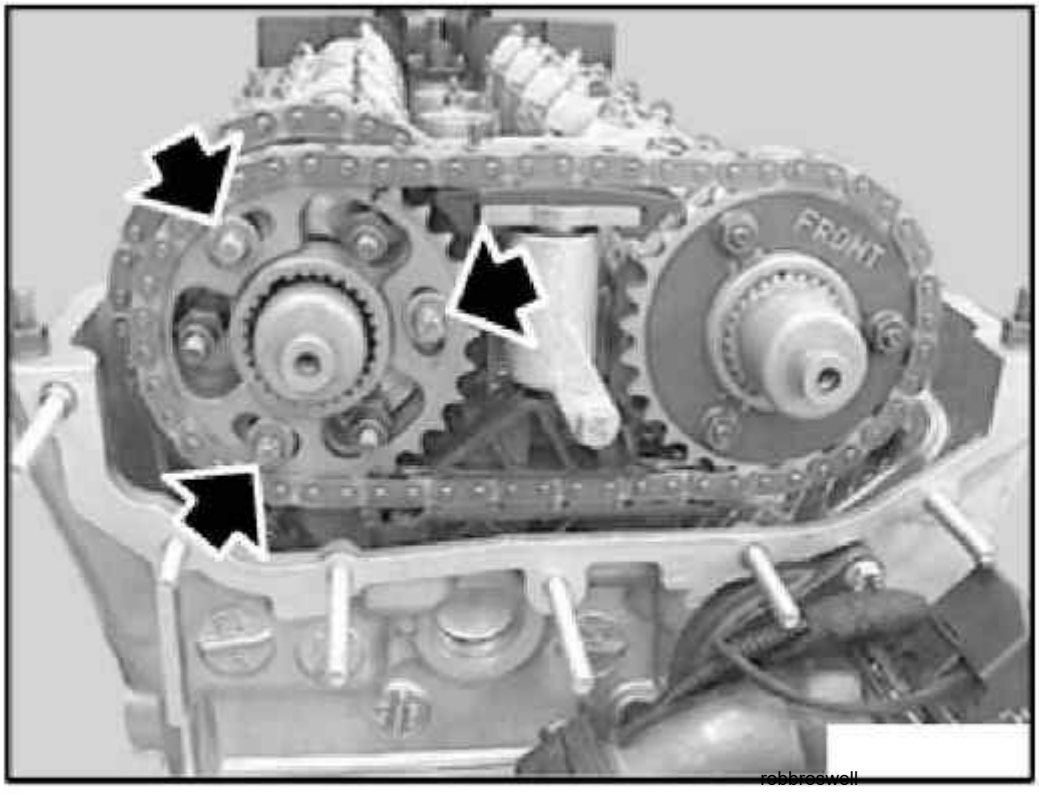


Fig. 211: Inserting Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Fit thrust washer (3).

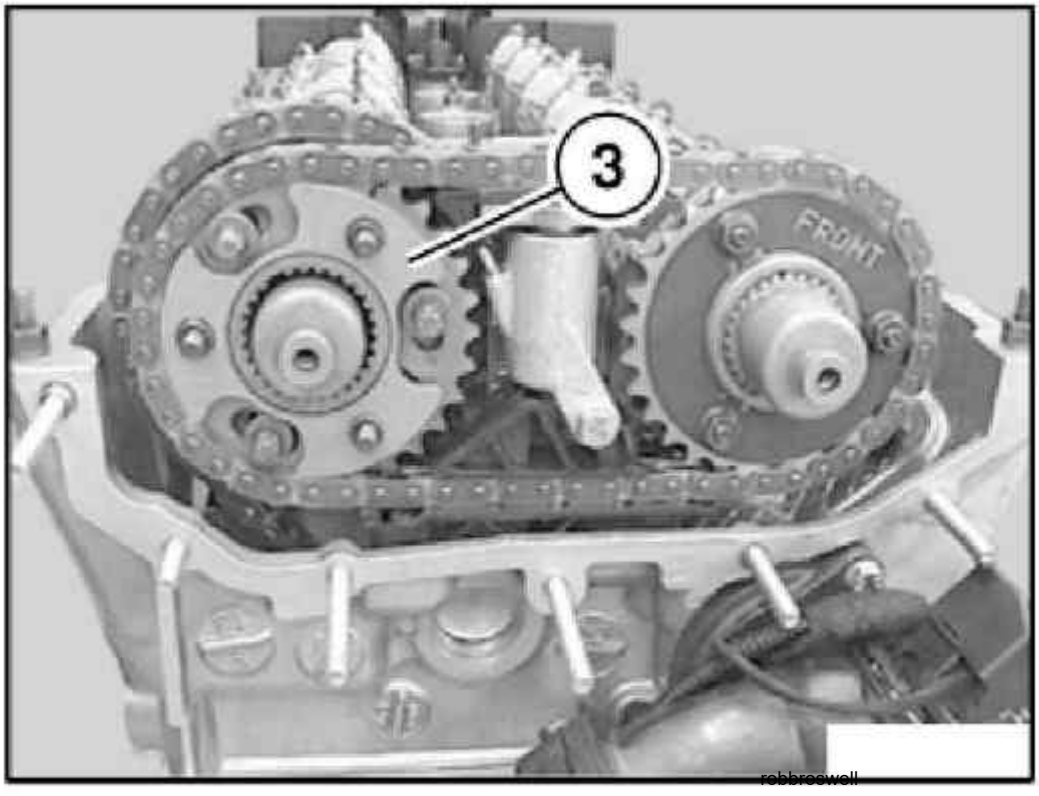


Fig. 212: Fitting Thrust Washer
Courtesy of BMW OF NORTH AMERICA, INC.

Note installation direction of cup spring (2), "F" lettering must be visible.

NOTE: **If "F" lettering is no longer visible on an engine that has been run:**
Install cup spring (2) so that small locating diameter of spring (2) points to sensor gear.
Fit cup spring (2) in position.

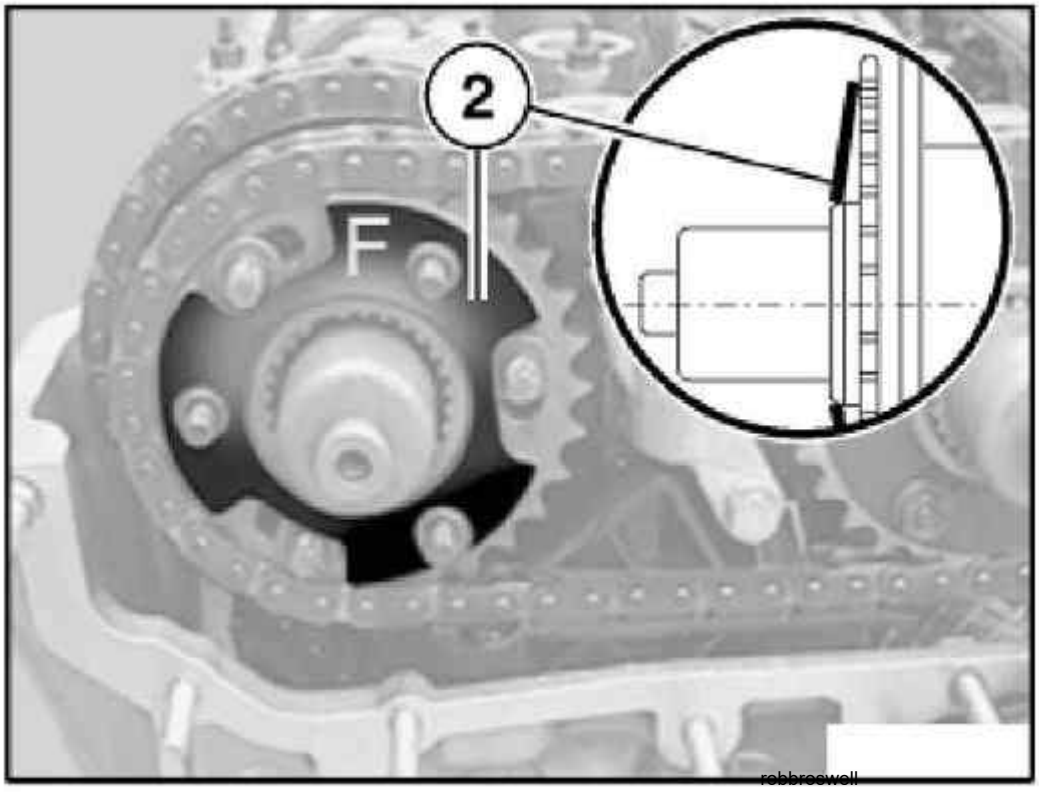


Fig. 213: Fitting Cup Spring In Position
Courtesy of BMW OF NORTH AMERICA, INC.

Position sensor gear (1) so that arrow on sensor gear faces separating face of upper side of cylinder head.

Install nuts and tighten by hand but do not tighten down fully yet.

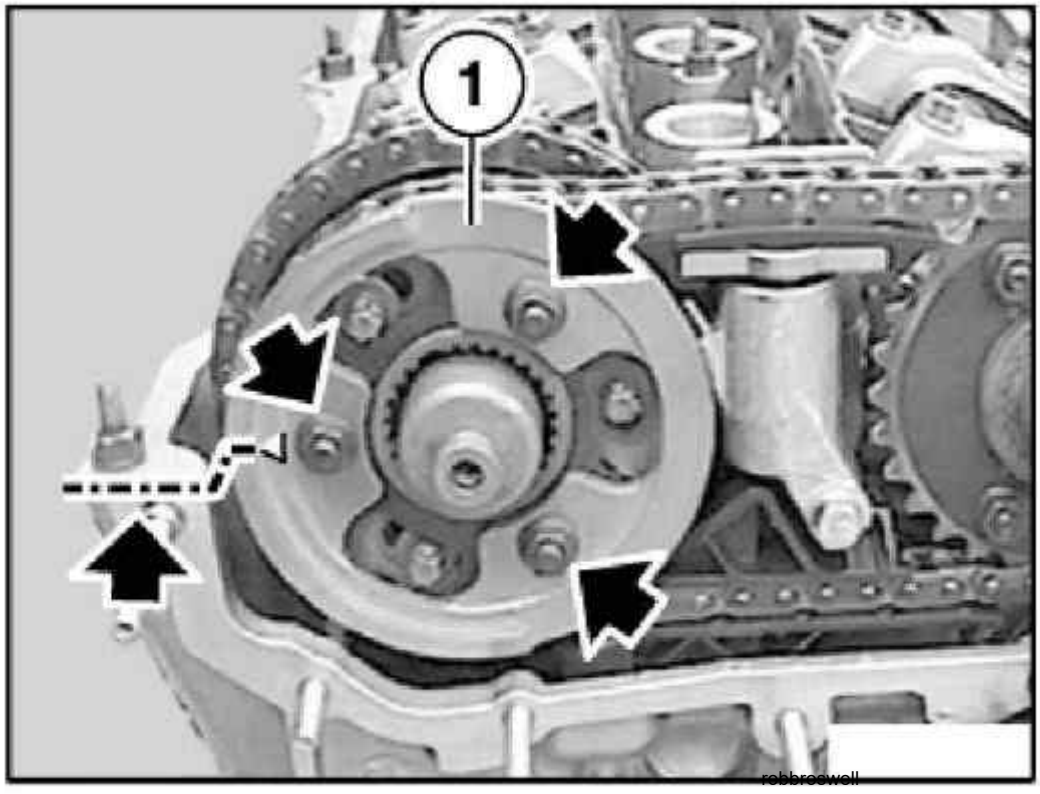


Fig. 214: Identifying Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw toothed shaft (5) up to stop.

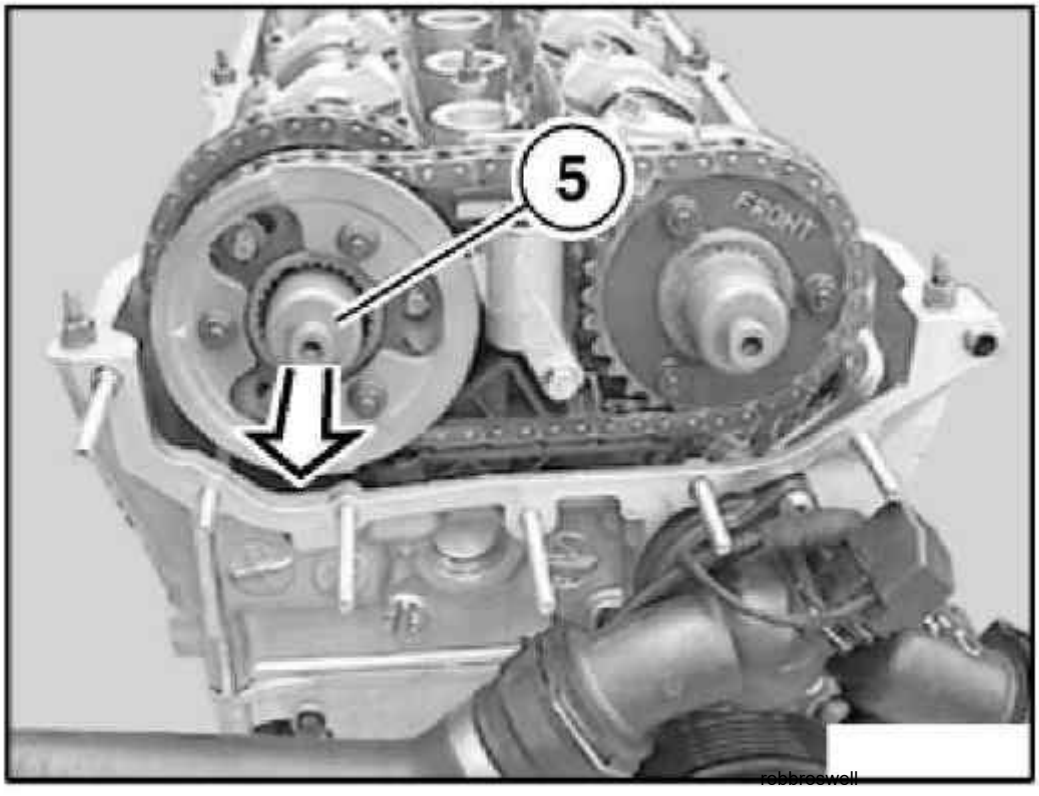


Fig. 215: Identifying Toothed Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Press down secondary chain tensioner at top and remove special tool 11 3 292.

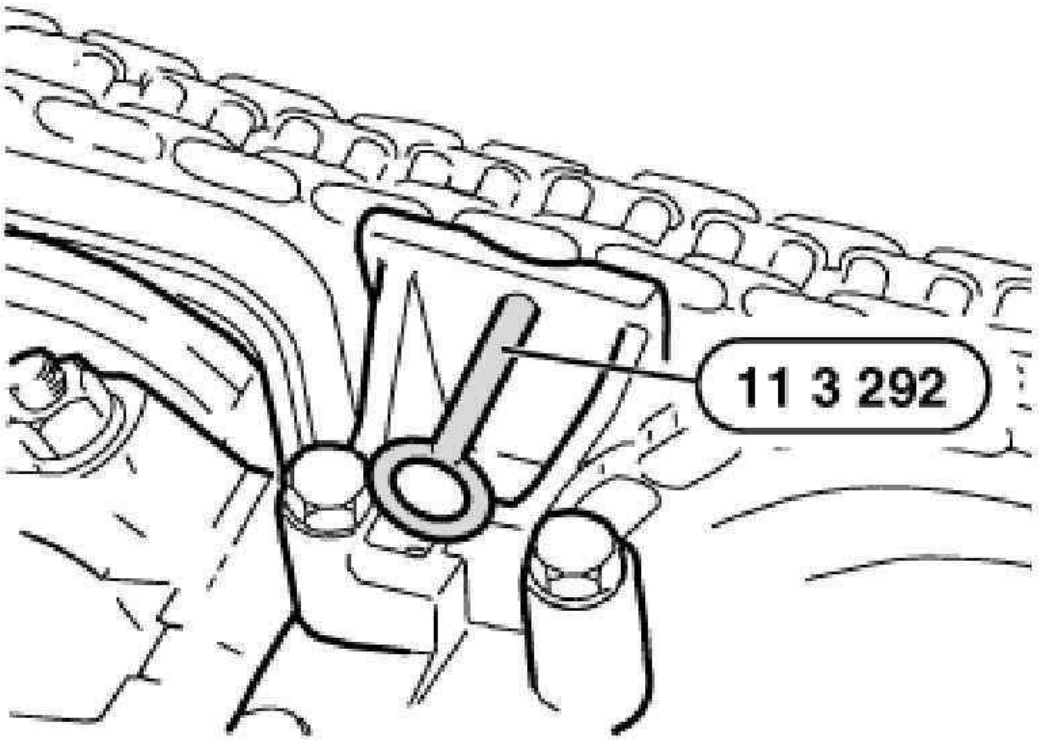


Fig. 216: Pressing Down Secondary Chain Tensioner
Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 Nm.

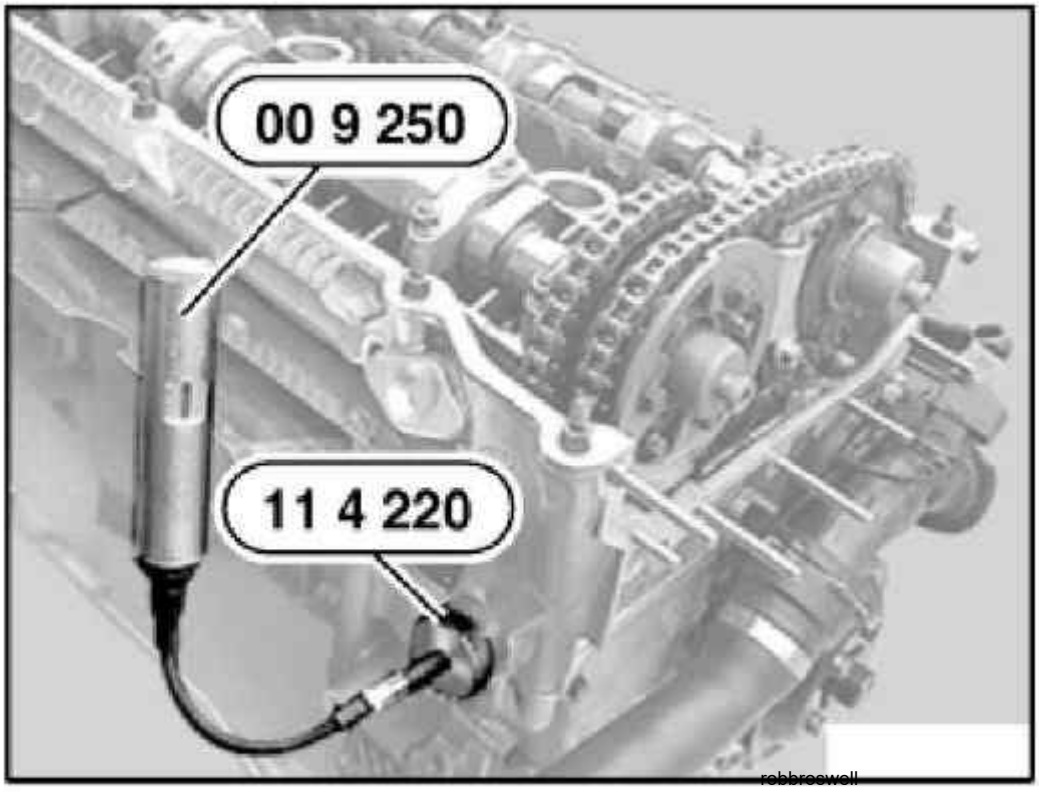


Fig. 217: Identifying Preload Tensioning Rail With Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Preload cup spring slightly by pressing on sensor gear (1) and tighten nuts by hand.

IMPORTANT: Do not tighten down nuts fully.

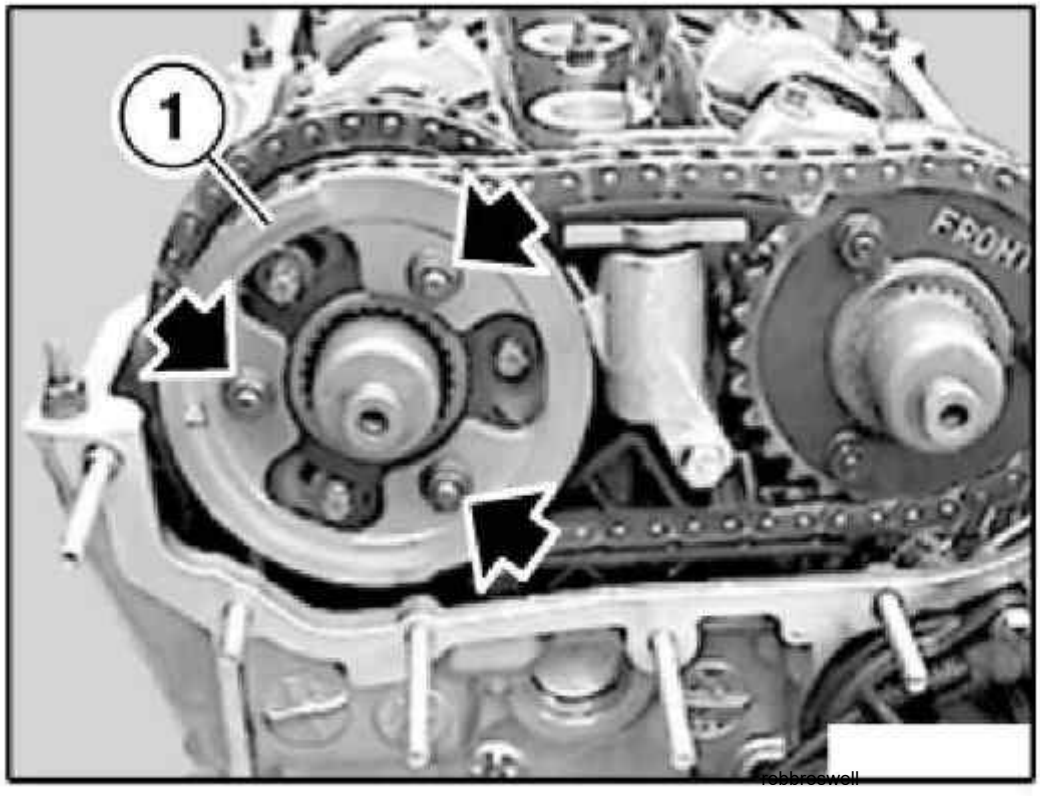


Fig. 218: Identifying Preload Cup Spring
Courtesy of BMW OF NORTH AMERICA, INC.

Remove gasket.

Check dowel sleeves (1) for damage and correct installation position.

Keep sealing face clean and free of oil.

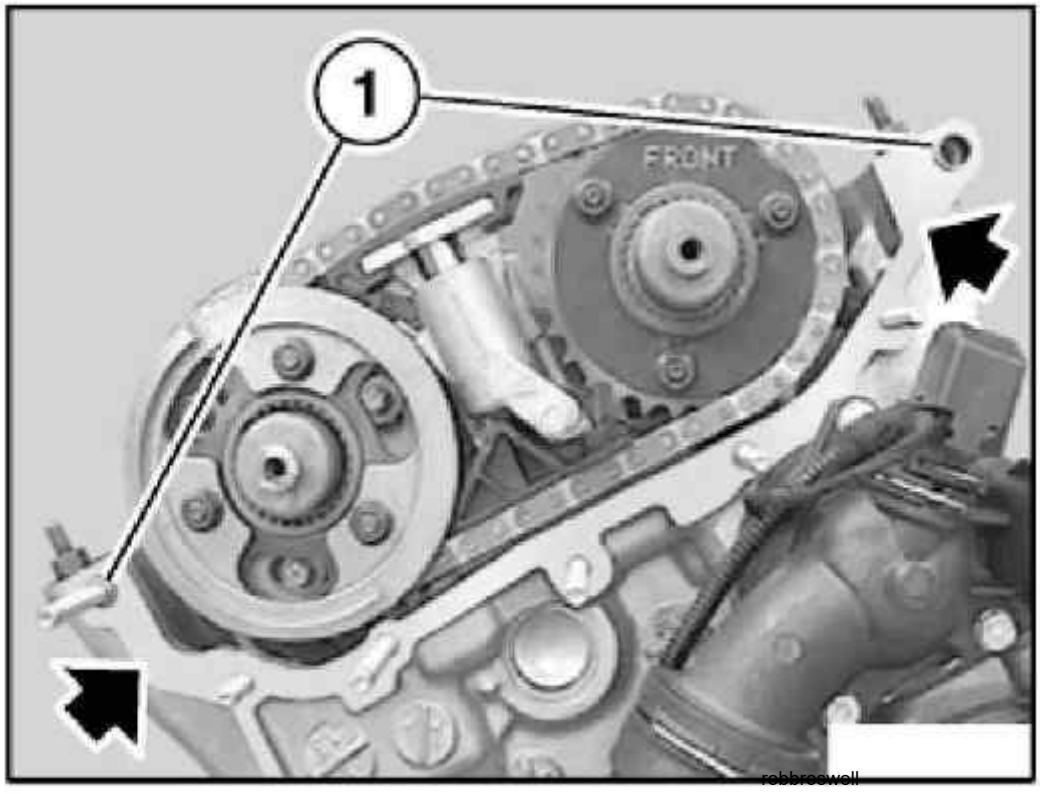


Fig. 219: Checking Dowel Sleeves
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Fit special tool 11 6 150 "without gasket" only.
If gasket remains underneath special tool 11 6 150, camshaft timing will be "incorrectly" set.

Attach special tool 11 6 150 "without gasket", tighten nuts by hand and then tighten down uniformly until special tool 11 6 150 is in full contact with cylinder head.

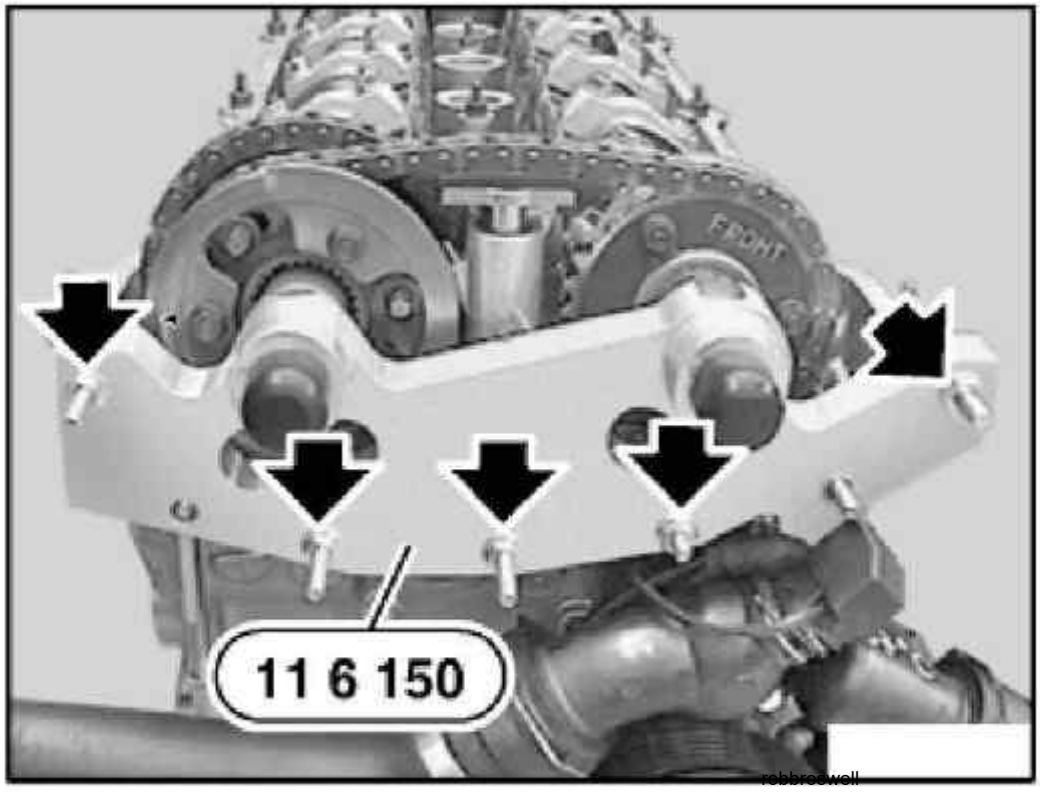


Fig. 220: Attaching Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws (1) on exhaust side and initially tighten to approx. 5 N.m

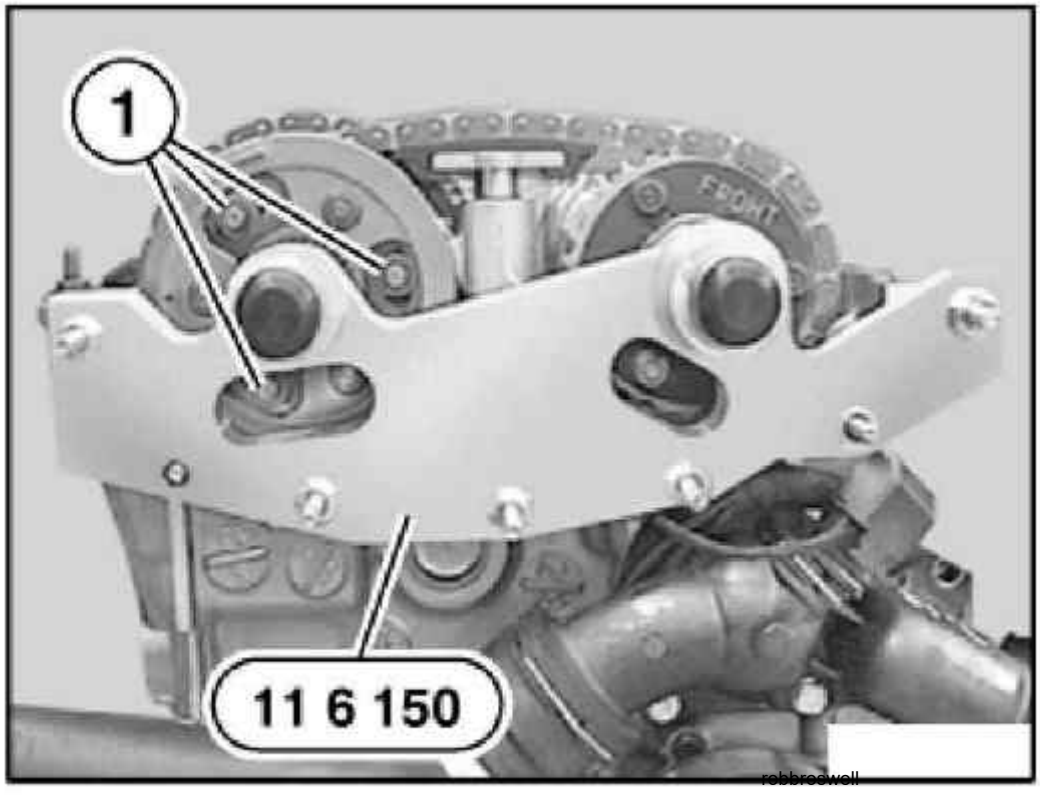


Fig. 221: Inserting Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten nuts (2) on exhaust side and nuts (3) on inlet side to approx. 5 N.m.

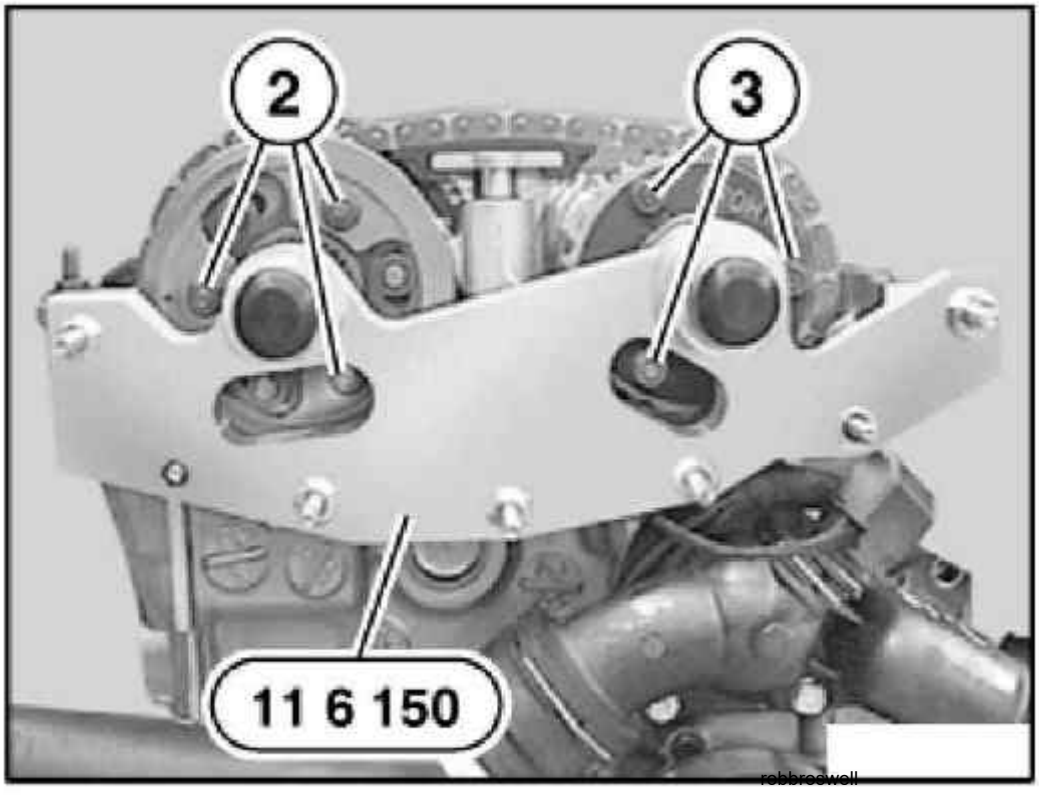
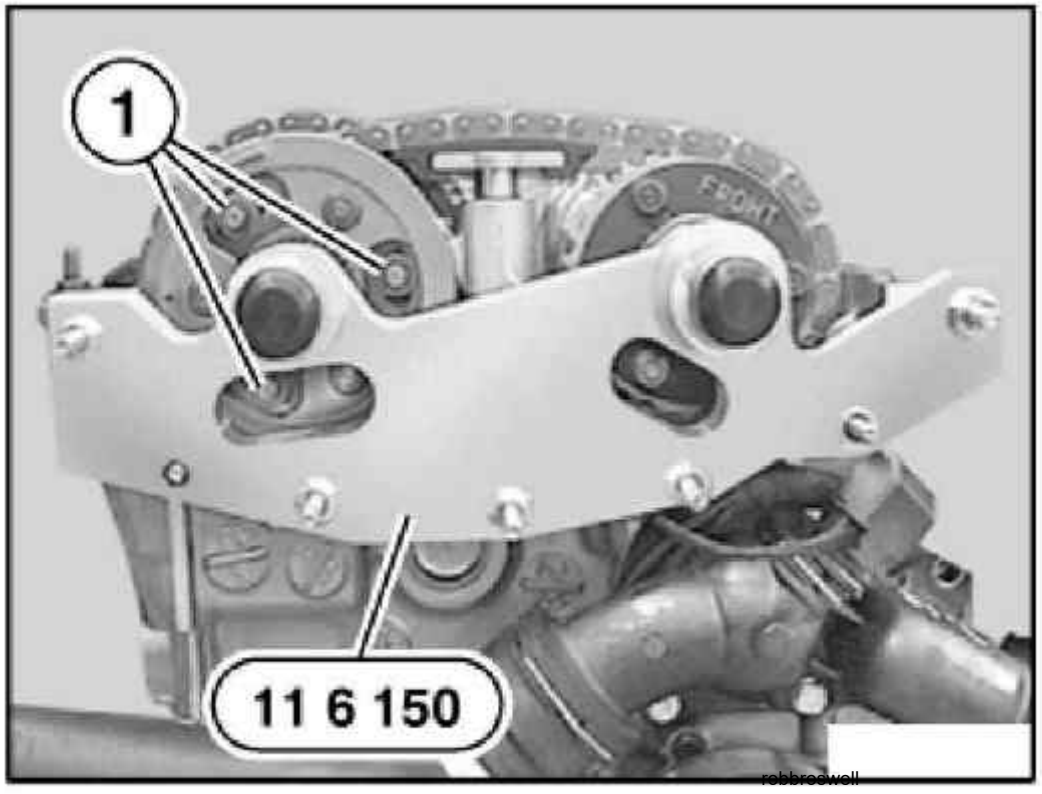


Fig. 222: Tightening Nuts On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down screws (1) on exhaust side.

Tightening torque, see 11 31 3AZ in **ENGINE - TIGHTENING TORQUES** .



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Fig. 223: Tightening Down Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down nuts (2) on exhaust side and nuts (3) on inlet side.

Tightening torque, see 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .

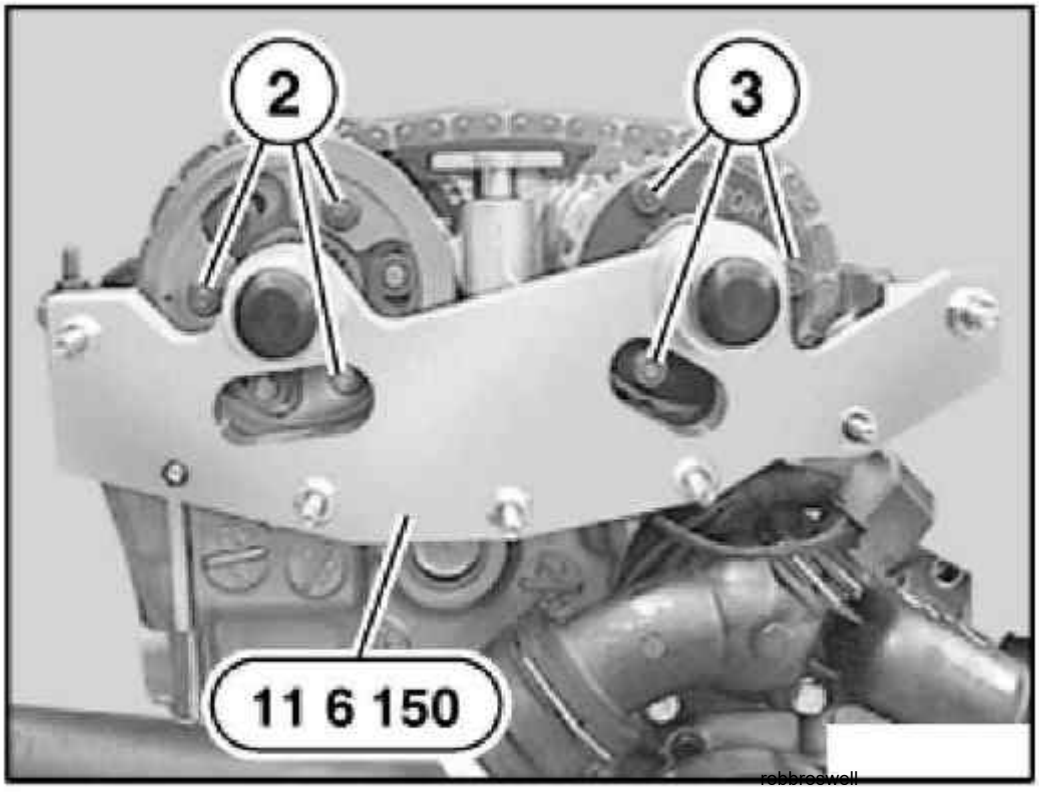


Fig. 224: Tightening Down Nuts On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 back until flywheel is no longer secured in position.

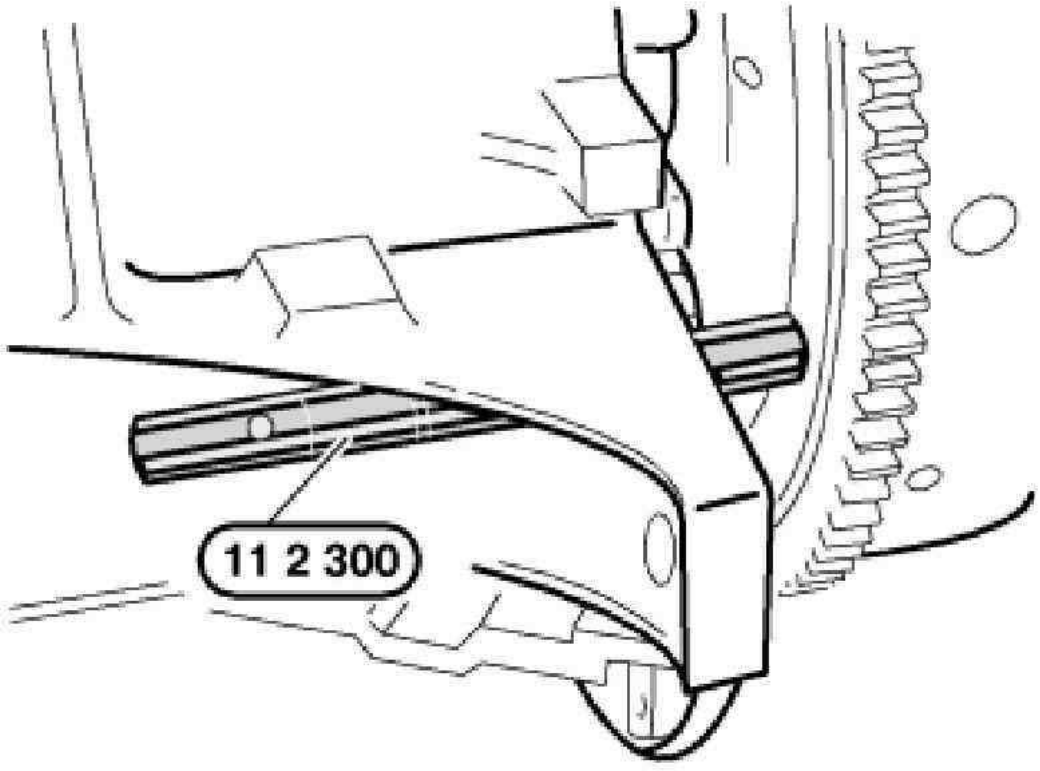


Fig. 225: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 244 and special tool 11 3 240.

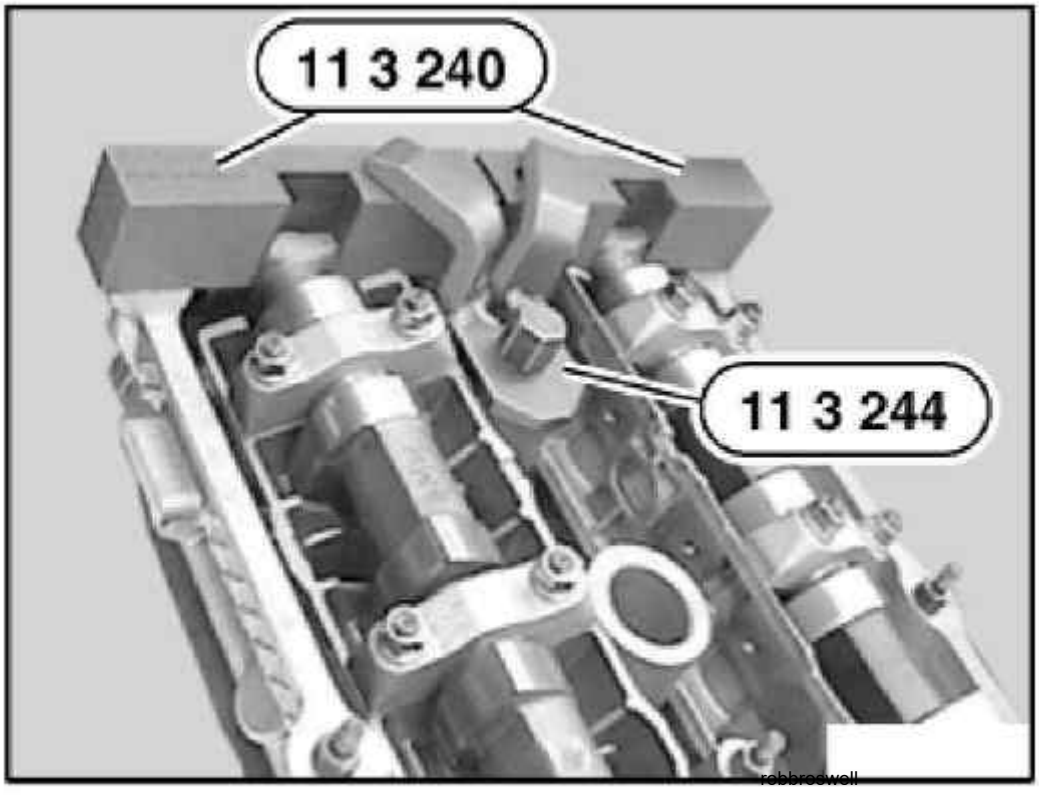


Fig. 226: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face one another.

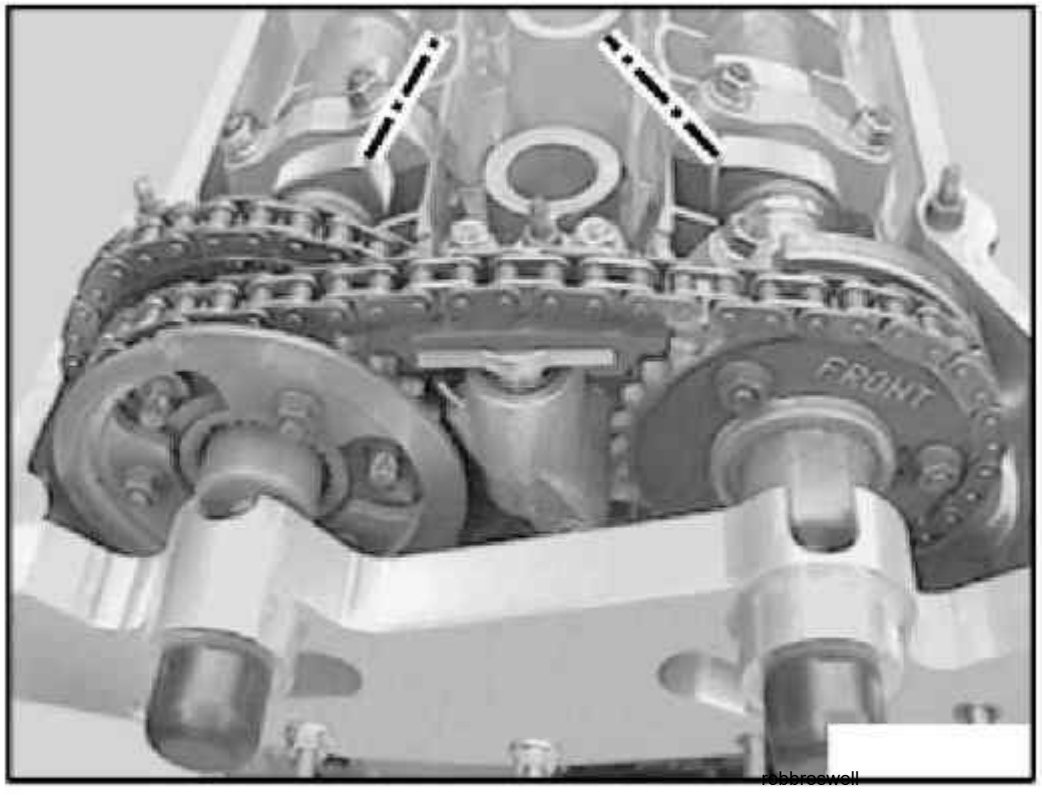


Fig. 227: Cranking Engine Twice In Direction Of Rotation Until
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300.

IMPORTANT: Do not turn the engine back.
Remove special tool 11 2 300 before switching on the engine.

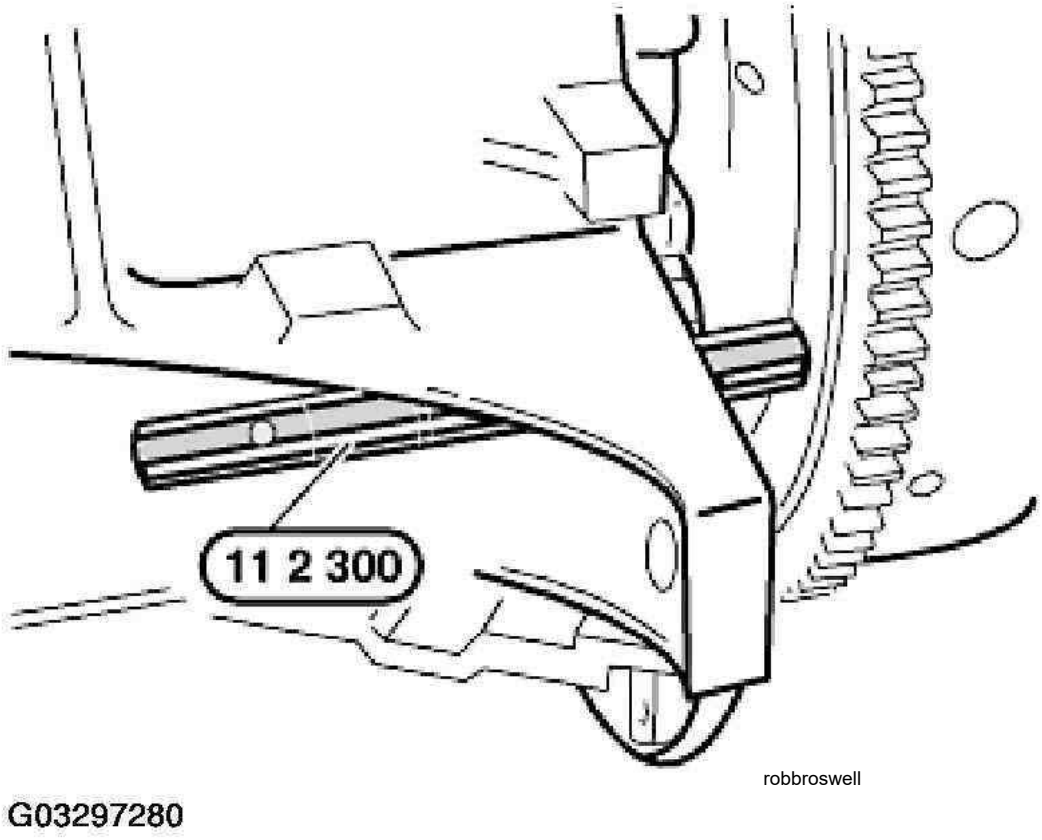


Fig. 228: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 240 to camshafts.

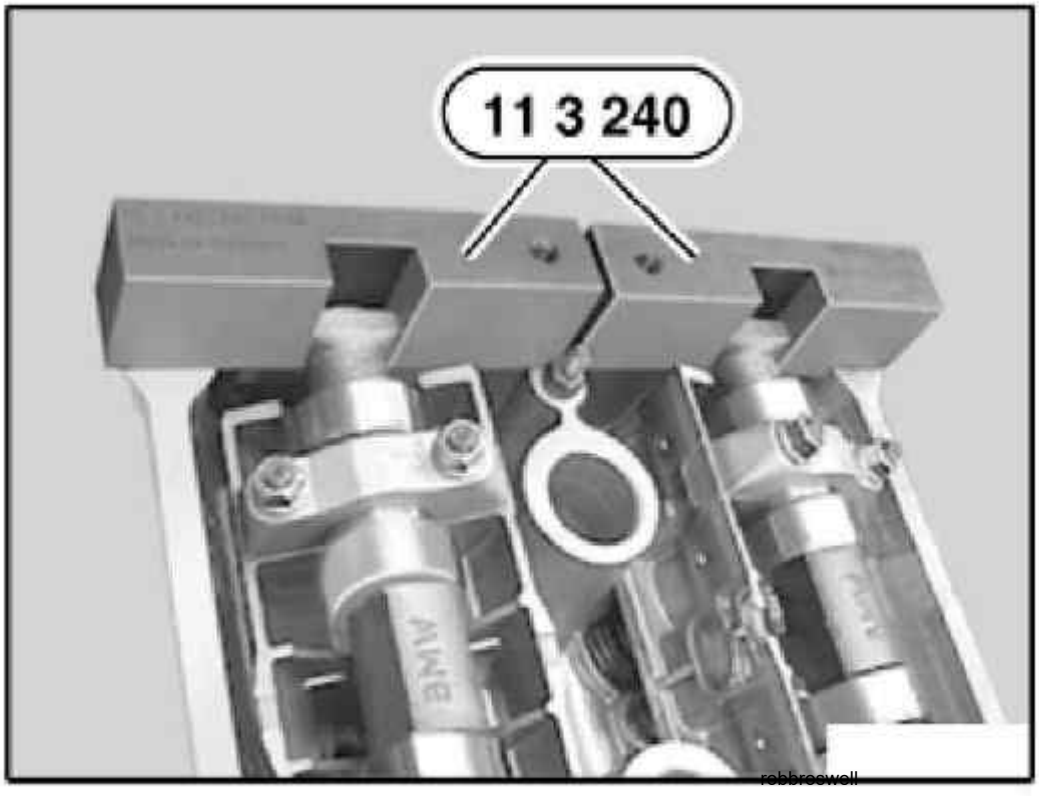


Fig. 229: Fitting Special Tool To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side.**
The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.

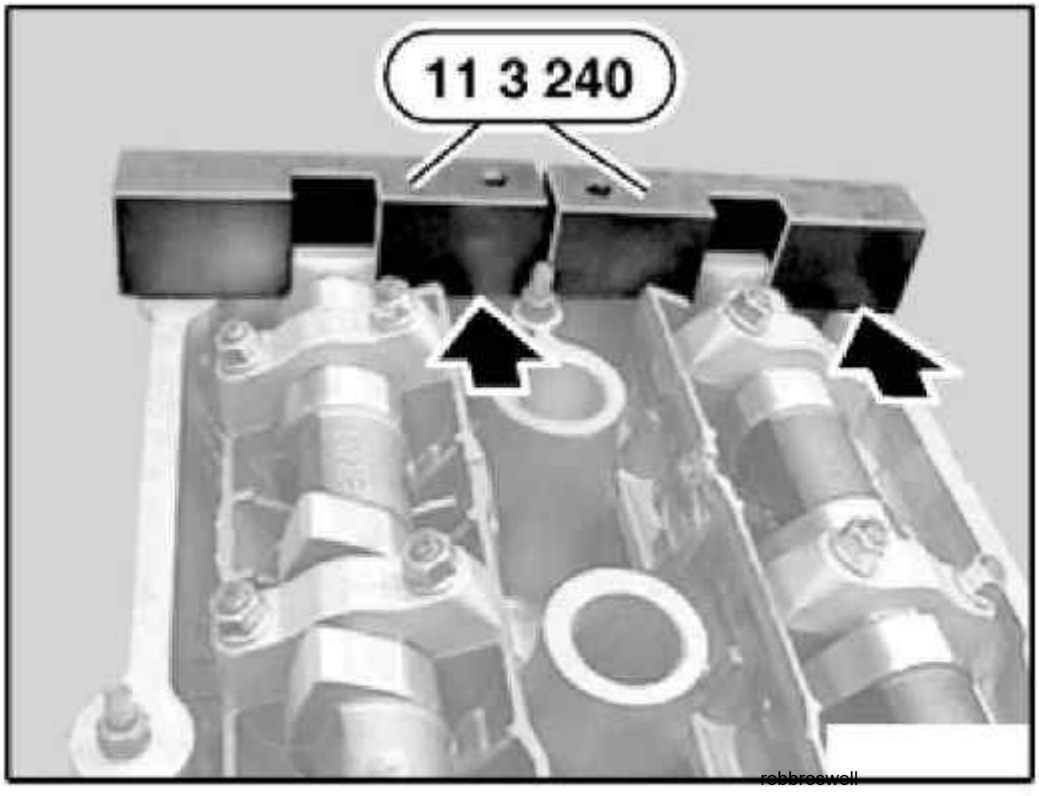
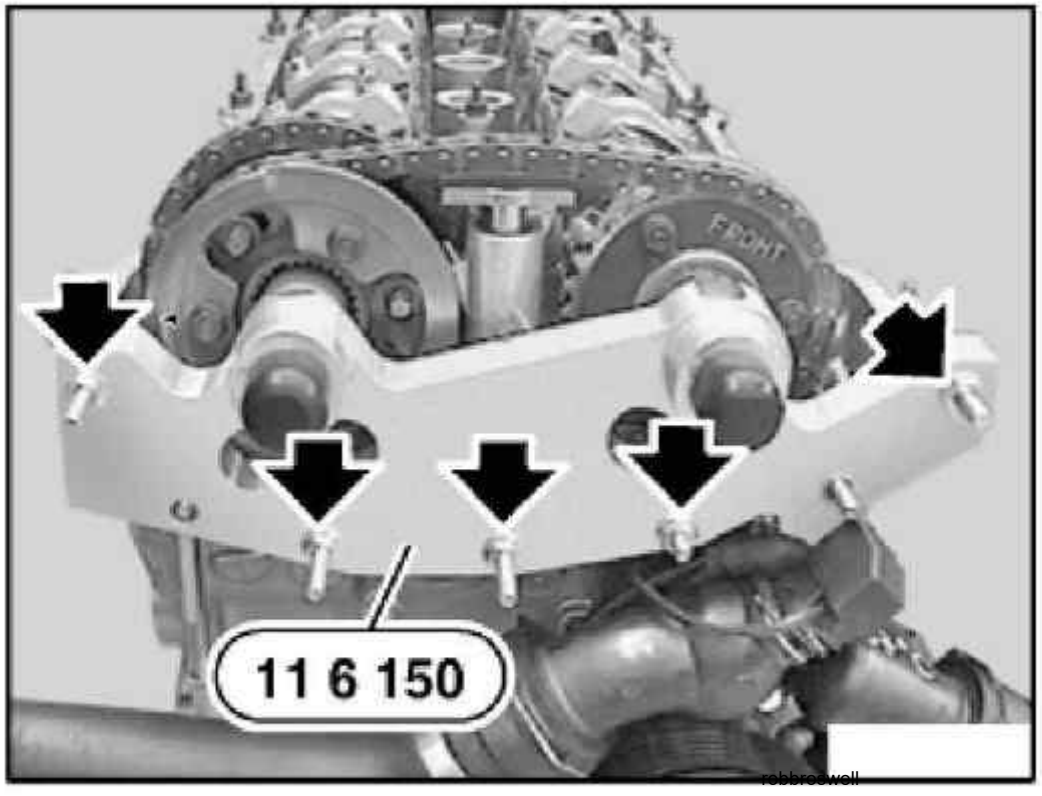


Fig. 230: Checking Timing
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 150.

Install VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

Assemble engine.



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Fig. 231: Removing Special Tool
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 005 CHECKING CAMSHAFT TIMING (M52TU / M54 / M56)

Special tools required:

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 450
- 11 4 220

Necessary preliminary tasks:

- Remove cylinder head cover See .
- Remove all spark plugs . See **12 12 011 REPLACING ALL SPARK PLUGS** .

Detach cover for inlet camshaft.

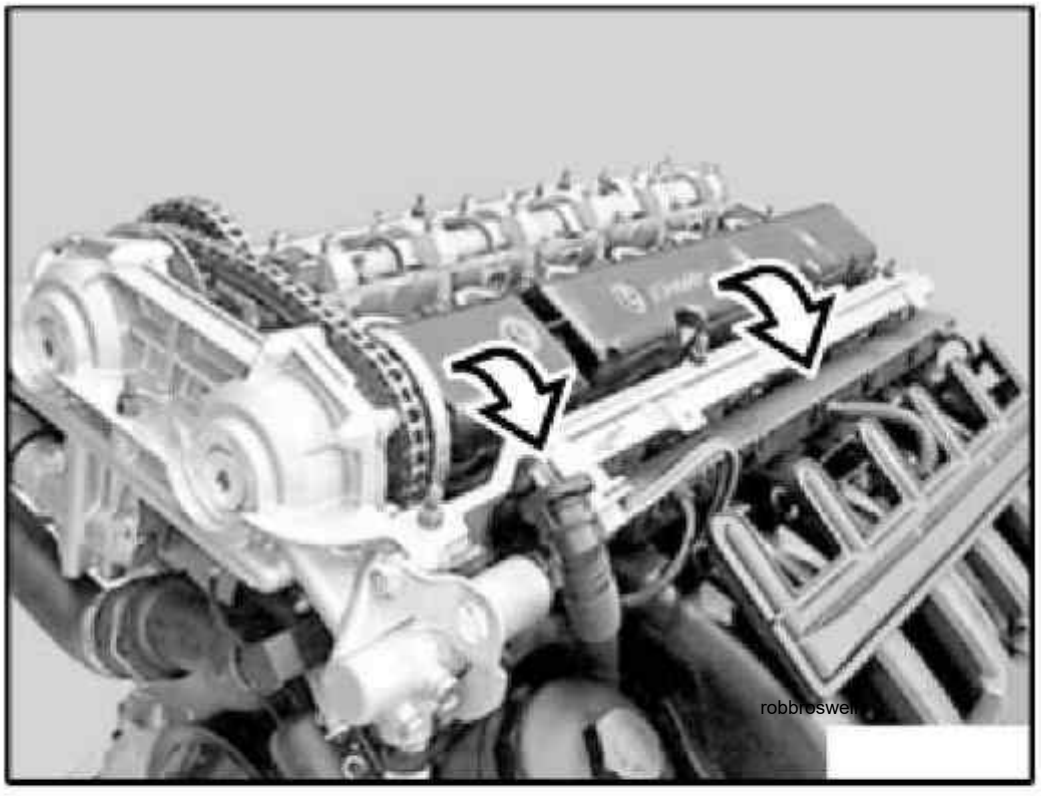


Fig. 232: Detaching Cover For Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cylinder for chain tensioning piston is under spring pressure.

Remove cylinder for chain tensioning piston.

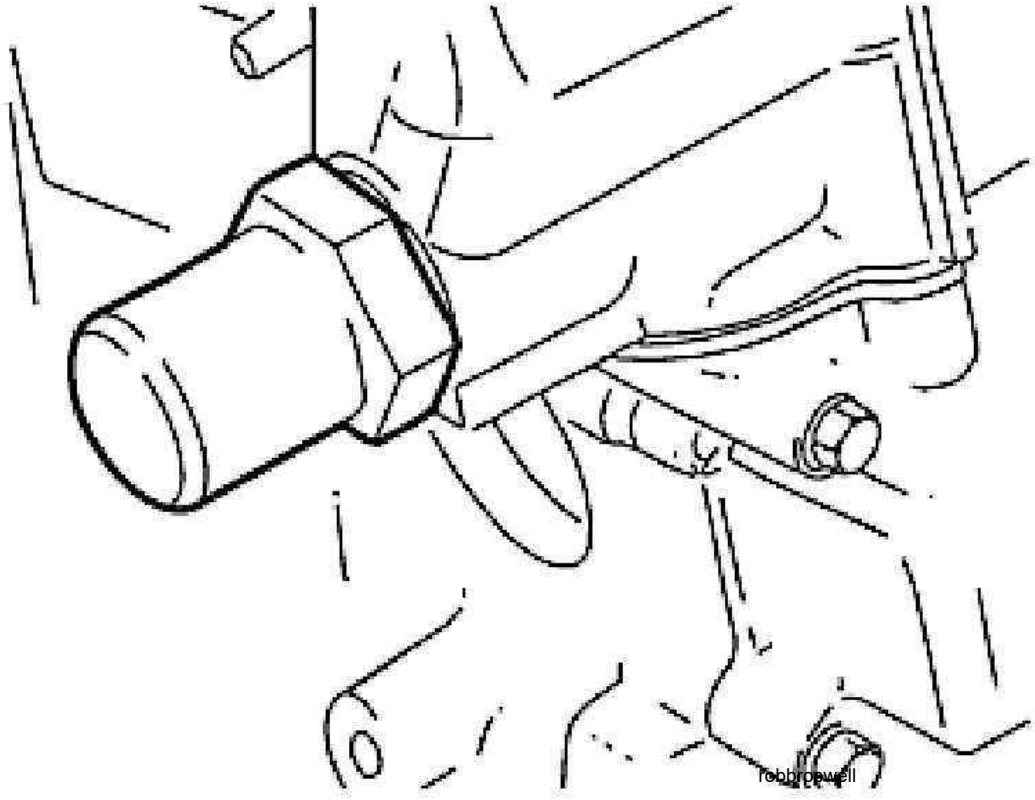


Fig. 233: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 4 220.

Fit adjusting screw to bow cover.

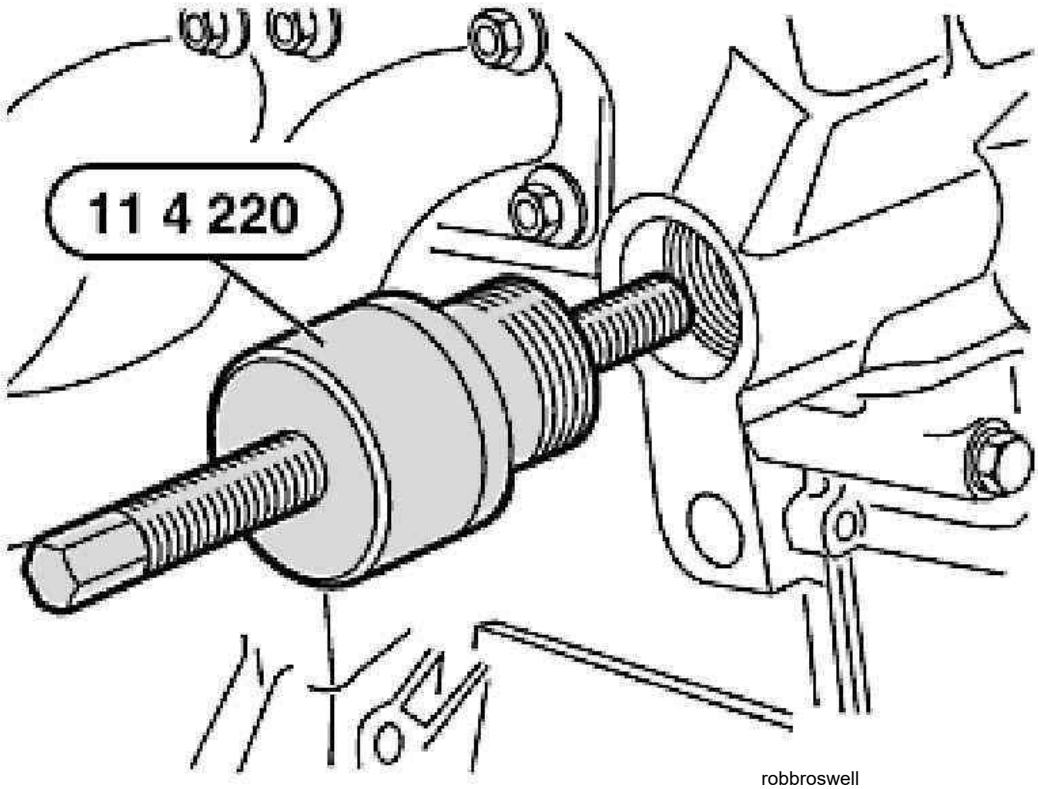


Fig. 234: Installing Special Tool 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 Nm.

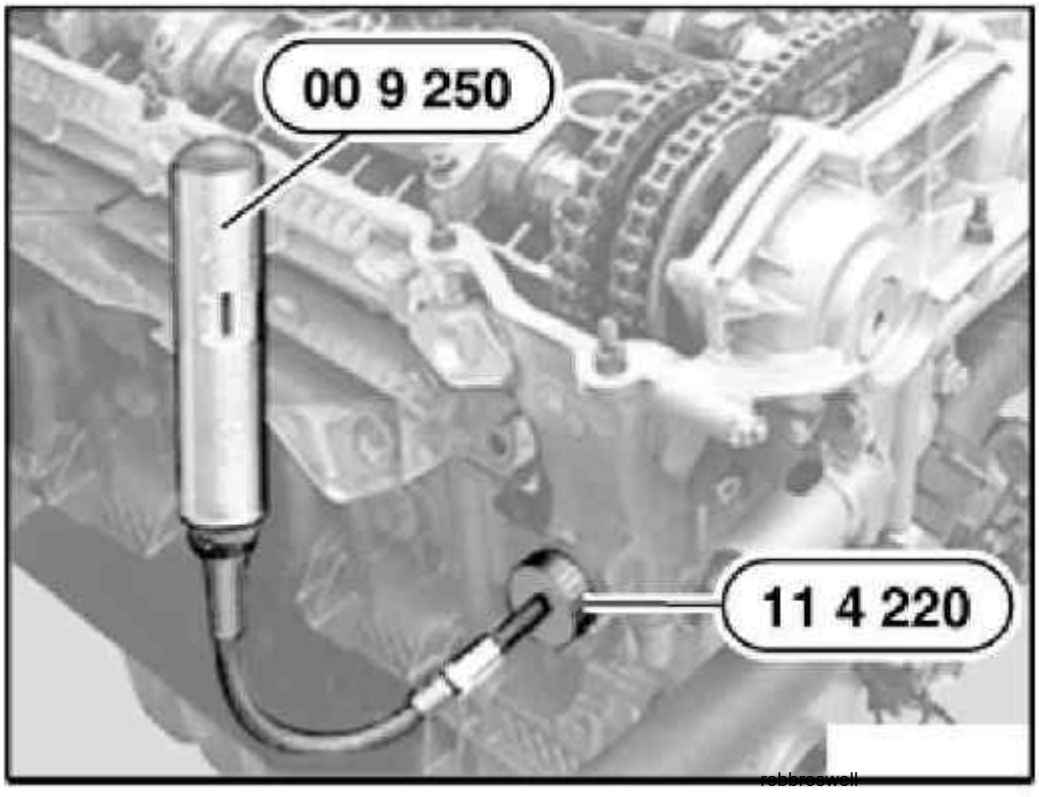


Fig. 235: Preloading Tensioning Rail With Special Tool 11 4 220 By Rotating Adjusting Screw With Special Tool 00 9 250
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew oil pressure pipe.

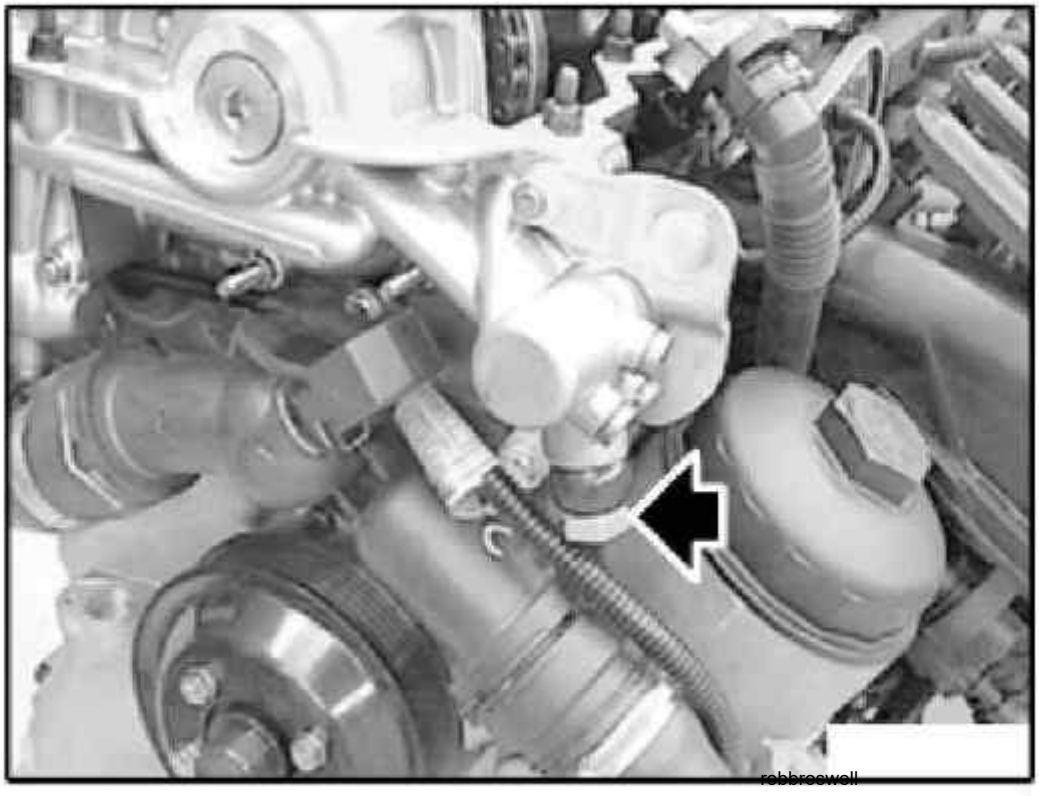


Fig. 236: Unscrewing Oil Pressure Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 11 3 450 with banjo bolt of oil pressure line.

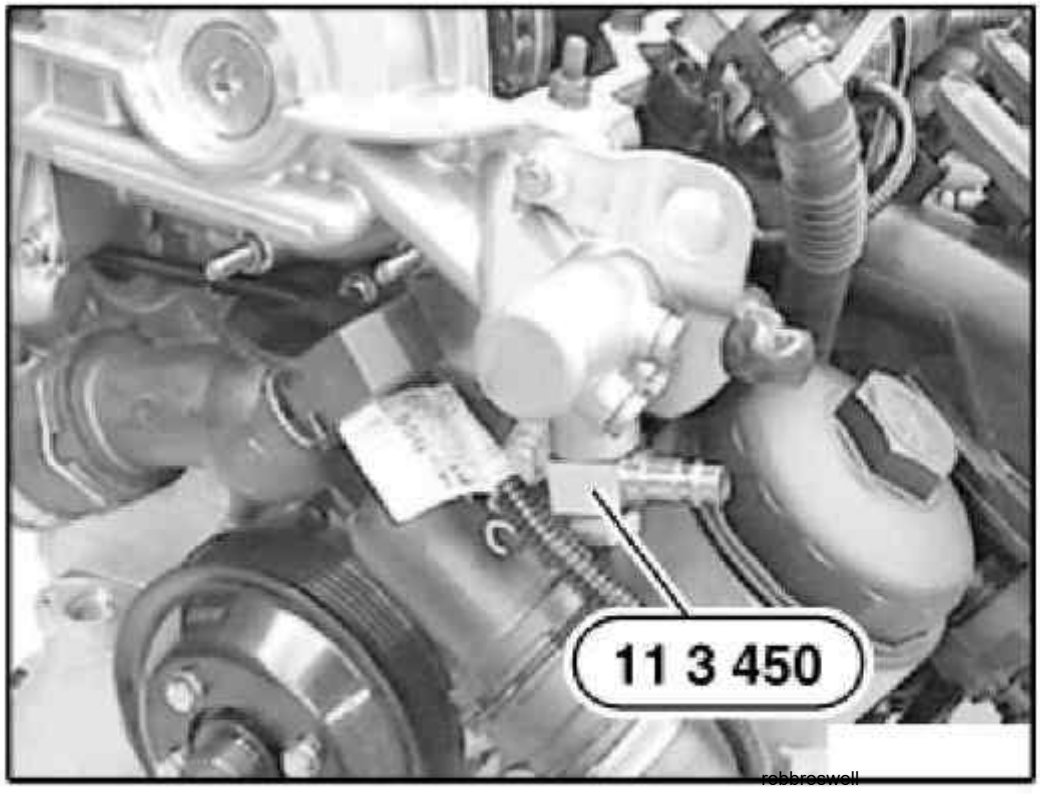


Fig. 237: Mounting Special Tool 11 3 450 With Banjo Bolt Of Oil Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cover double VANOS adjustment unit; when the compressed air supply is connected, several drops of oil are sprayed out of the bore.

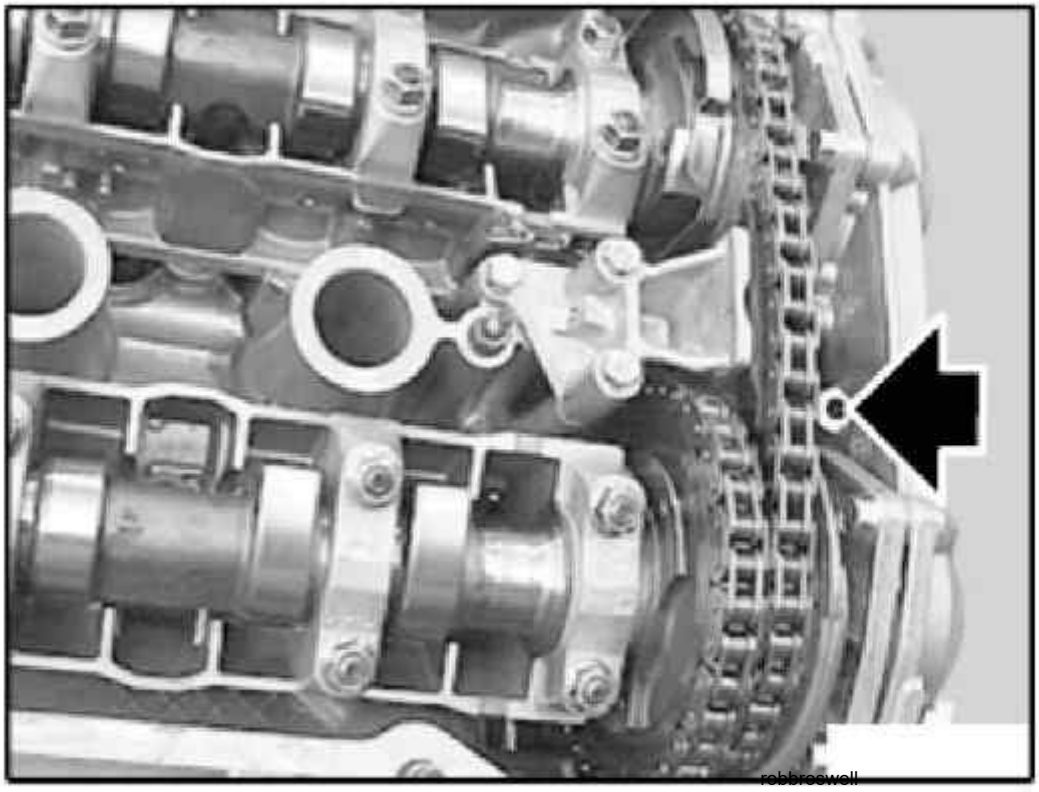
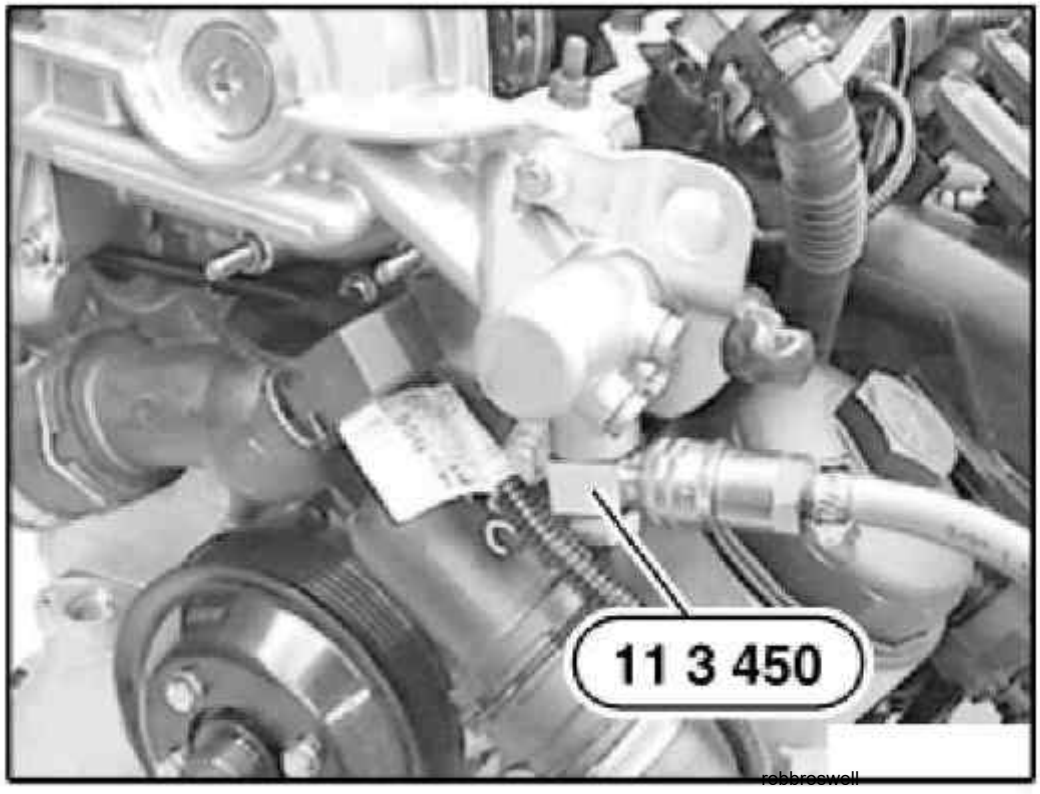


Fig. 238: Covering Double VANOS Adjustment Unit When Compressed Air Supply Is Connected
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air (2 to 8 bar).



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Fig. 239: Connecting Compressed Air
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: When the engine is switched off, it is possible that the camshafts are not in their initial positions. With the compressed air supply connected, rotate the engine to return the camshafts to their initial positions.

With compressed air supply connected, crank engine at least two revolutions in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face each other.

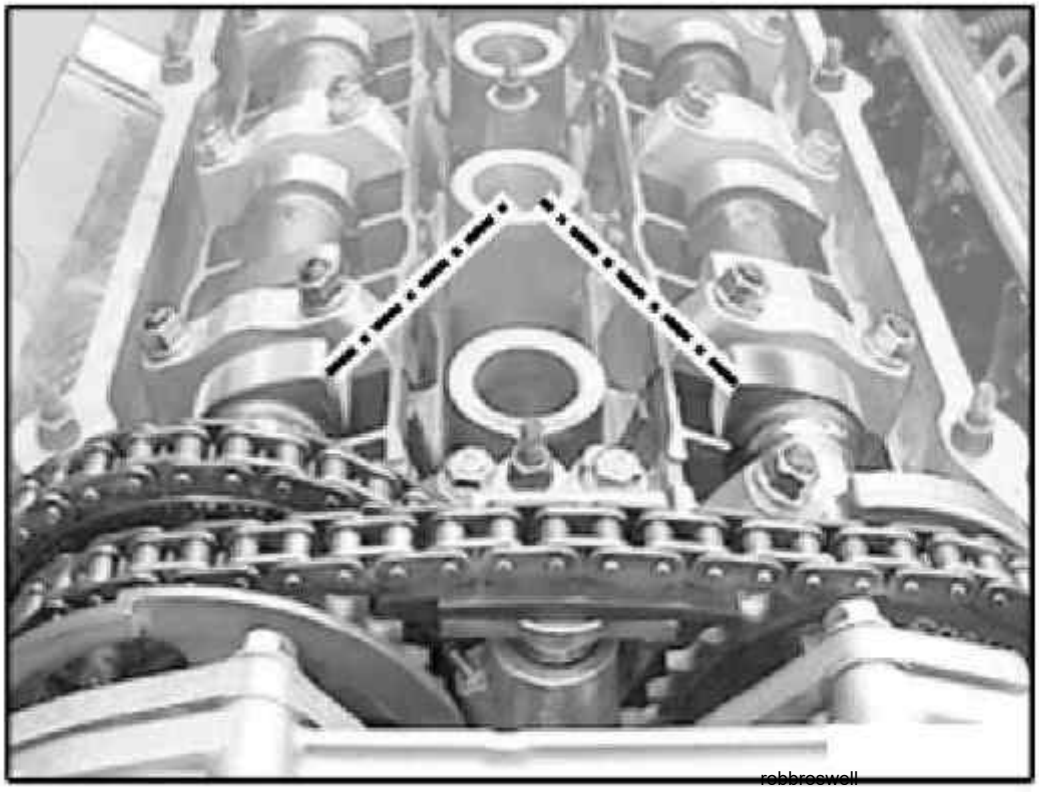


Fig. 240: Ensuring Cam Tips Face Each Other
Courtesy of BMW OF NORTH AMERICA, INC.

Pull dust guard out of the special tool bore.

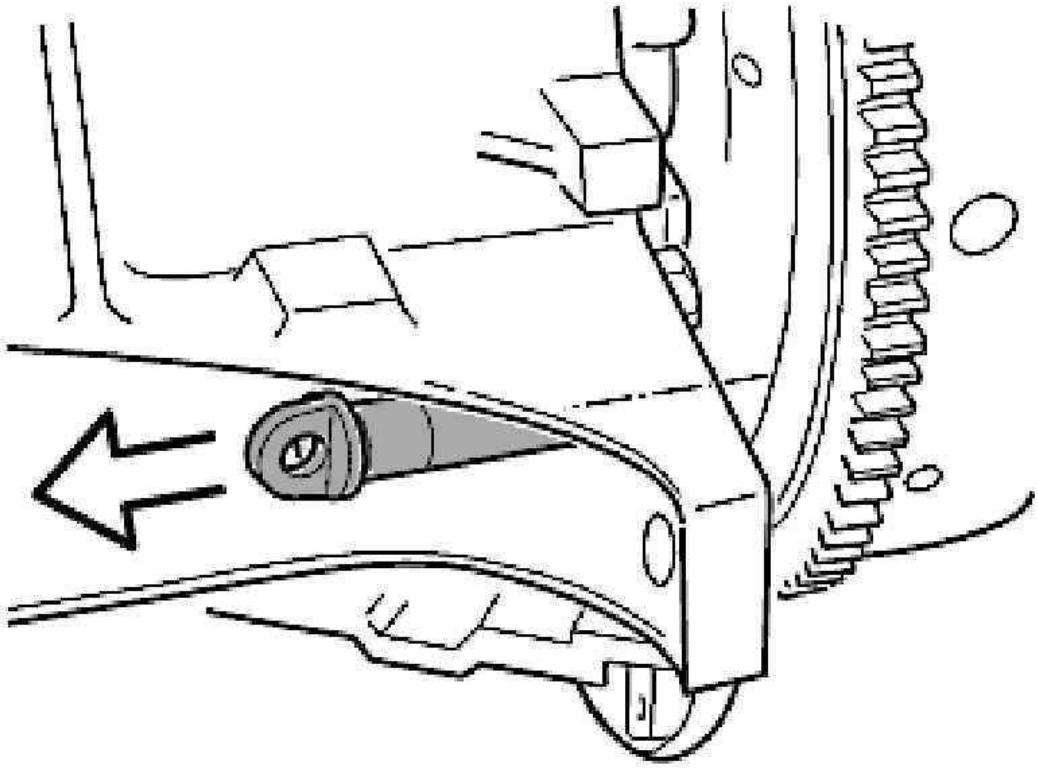


Fig. 241: Pulling Dust Guard Out Of Special Tool Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft with special tool 11 2 300 in TDC firing position of 1st cylinder.

IMPORTANT: Do not turn the engine back.
Remove special tool 11 2 300 before starting engine.

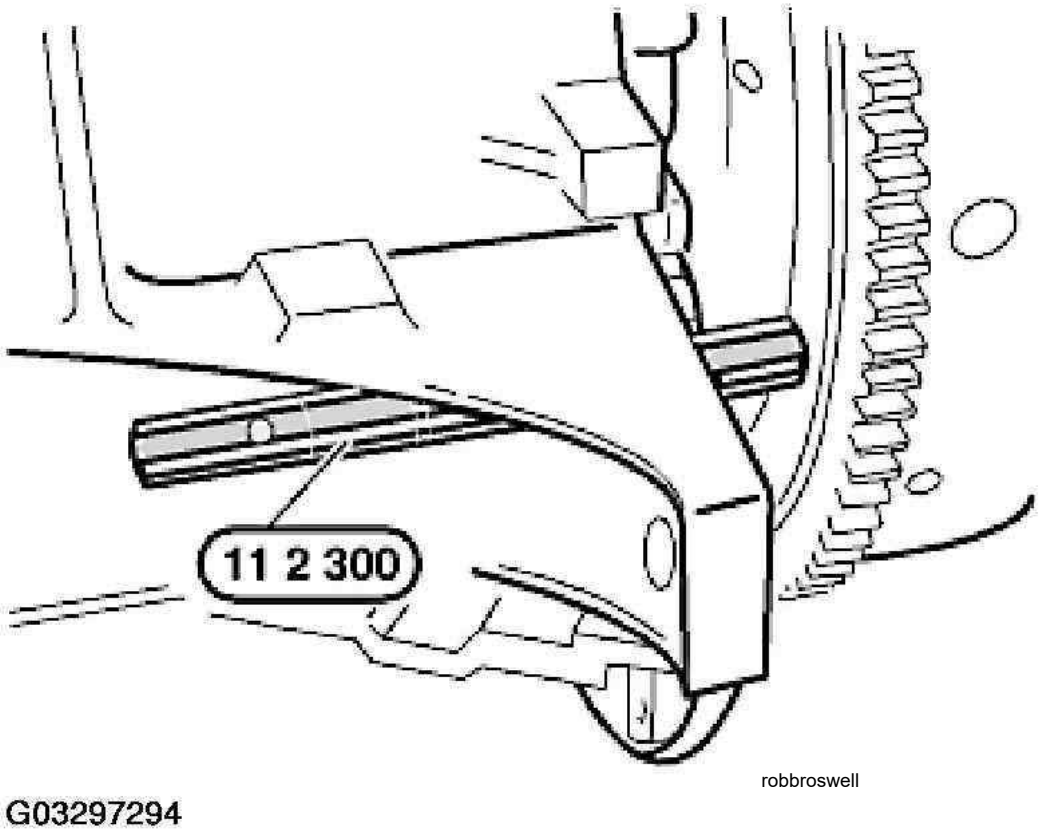


Fig. 242: Securing Crankshaft With Special Tool 11 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmissions only:

Illustration does not show automatic transmission.

IMPORTANT: On engines with automatic transmissions, there is shortly before the special tool bore (1) a large bore (2) which can be confused with the special tool bore (1)

If special tool 11 2 300 is secured in the correct bore (1), the engine can no longer be cranked at the central bolt.

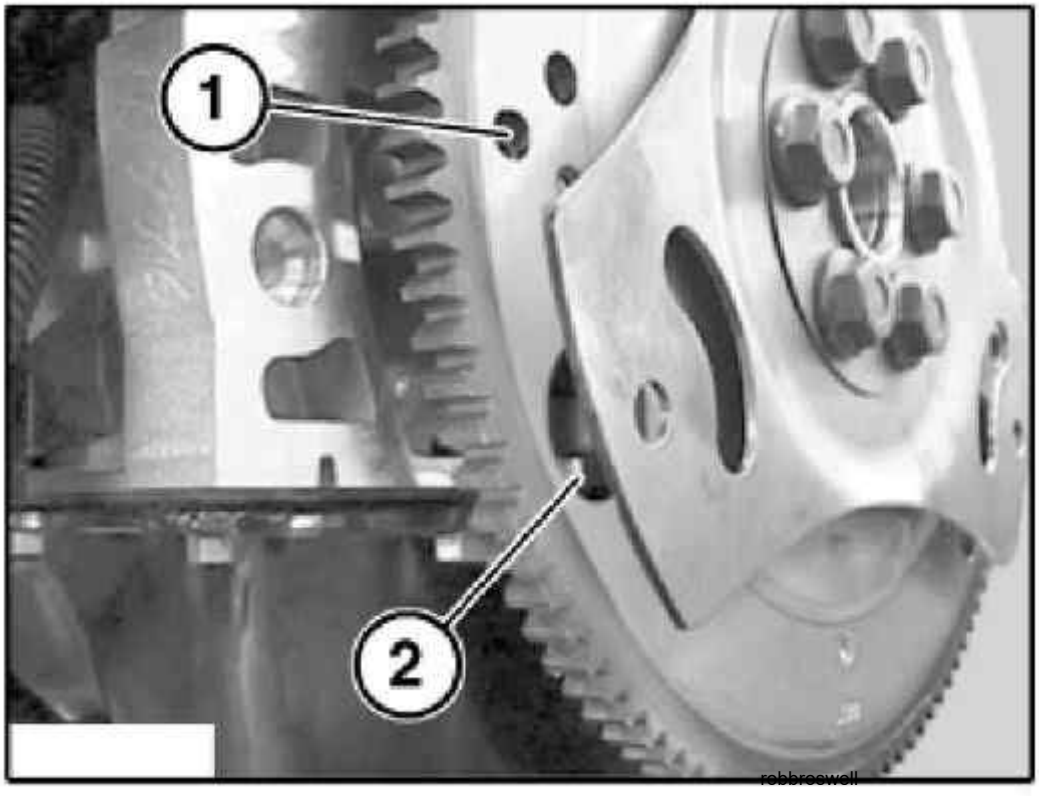


Fig. 243: Identifying Bore On Engine With Automatic Transmission
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

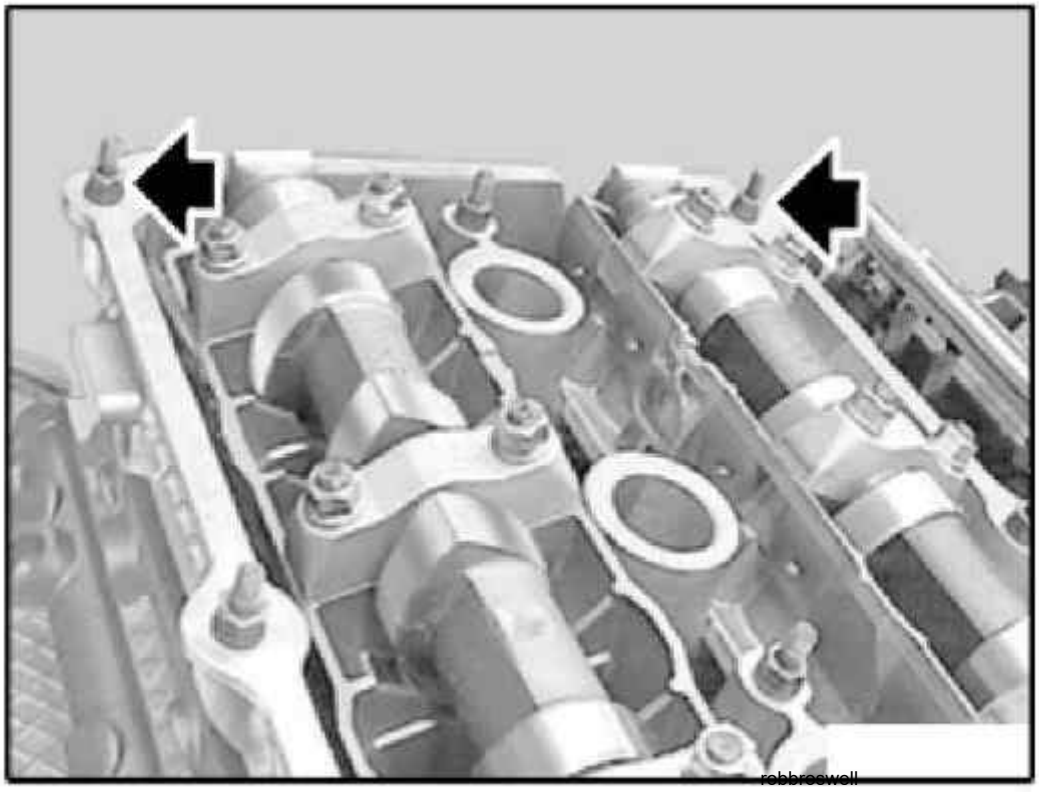


Fig. 244: Unscrewing Studs
Courtesy of BMW OF NORTH AMERICA, INC.

Place special tool 11 3 240 on camshafts.

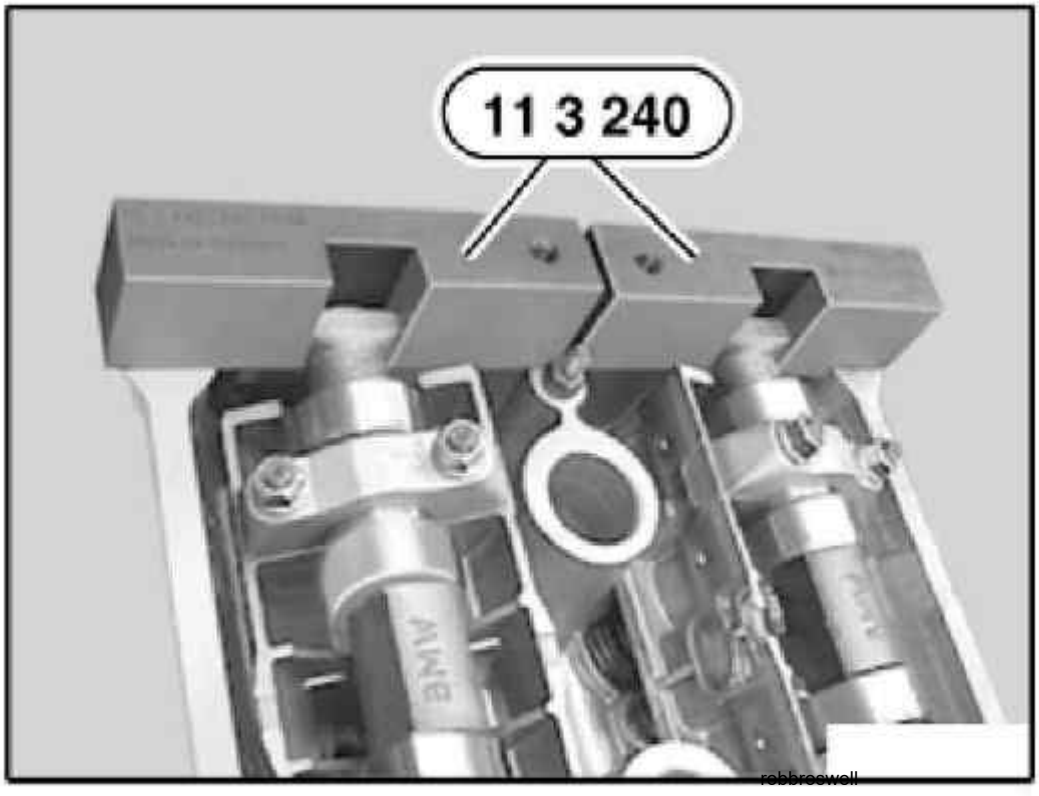


Fig. 245: Placing Special Tool 11 3 240 On Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side.**
The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.
If necessary, adjust camshaft timing.

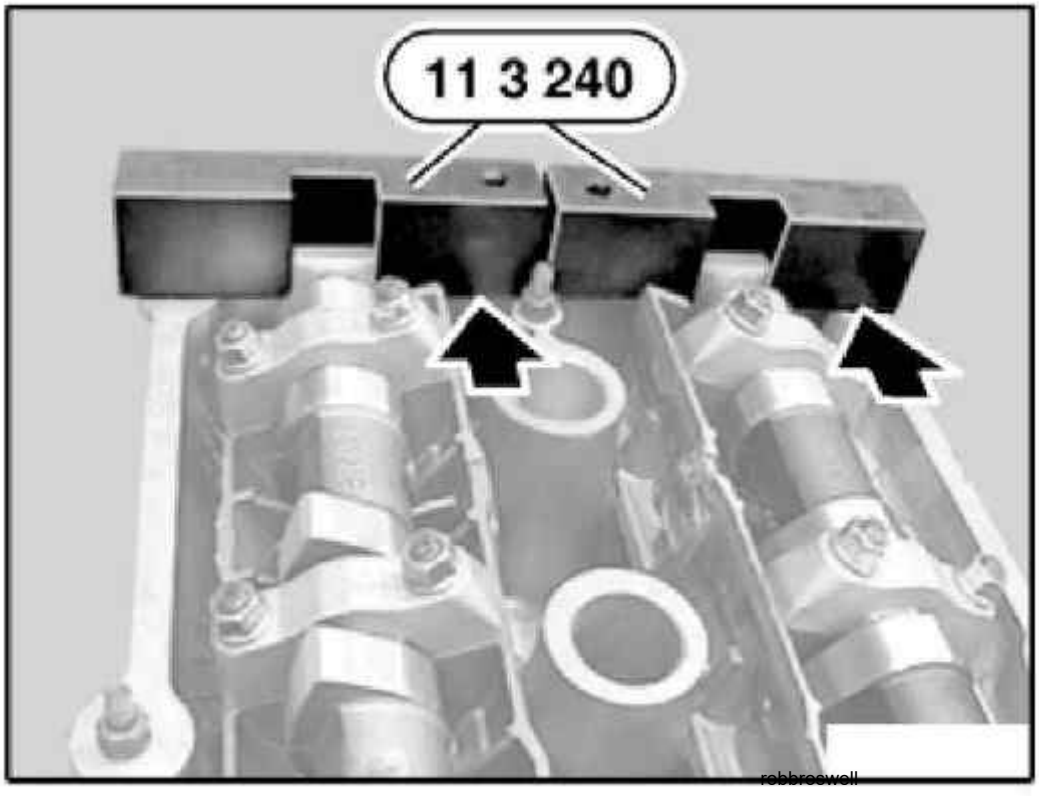


Fig. 246: Resting Special Tool 11 3 240 Without Gap On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Detach compressed air connection.

Remove special tool 11 3 450.

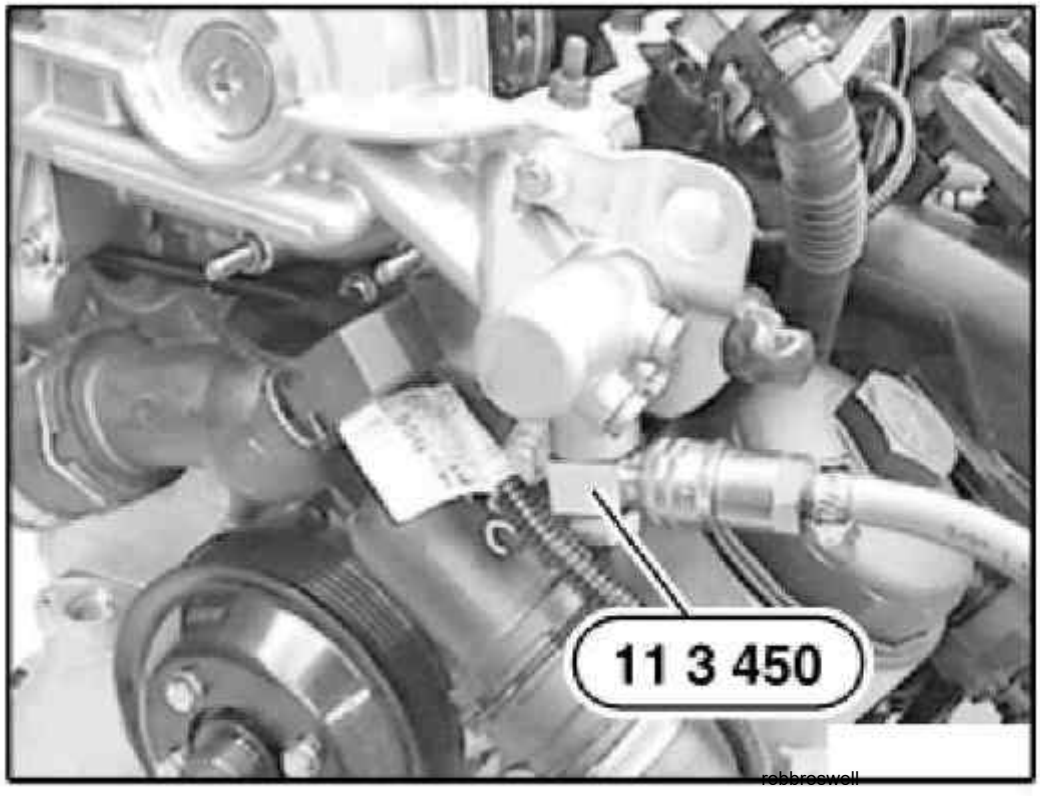


Fig. 247: Removing Special Tool 11 3 450
Courtesy of BMW OF NORTH AMERICA, INC.

Fit oil pressure line with new seals.

Tightening torque, see 11 36 2AZ in **ENGINE - TIGHTENING TORQUES** .

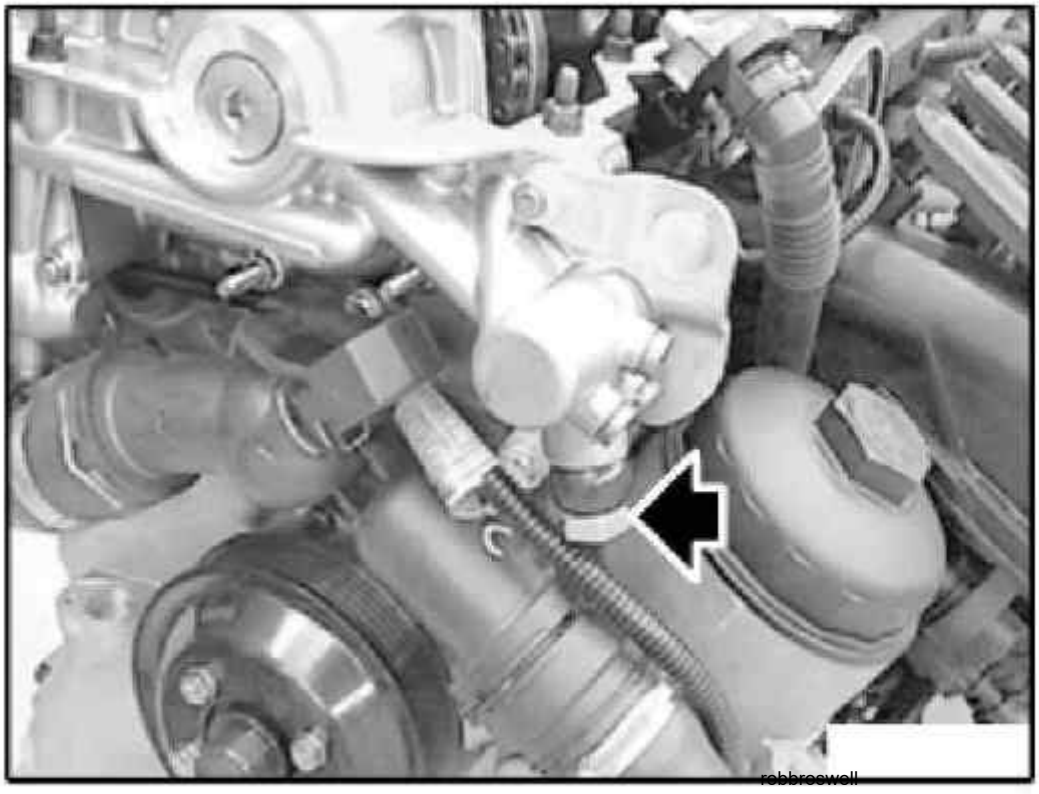


Fig. 248: Fitting Oil Pressure Line With New Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 240.

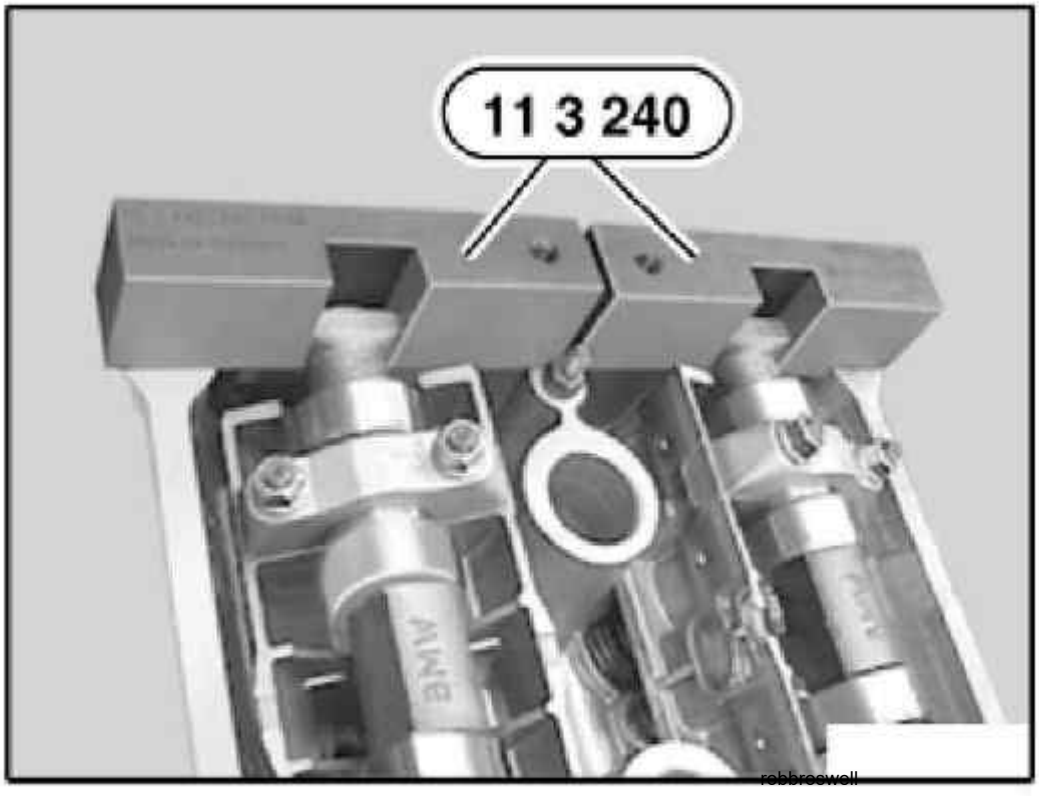


Fig. 249: Removing Special Tool 11 3 240
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 2 300.

Install dust guard from inspection bore.

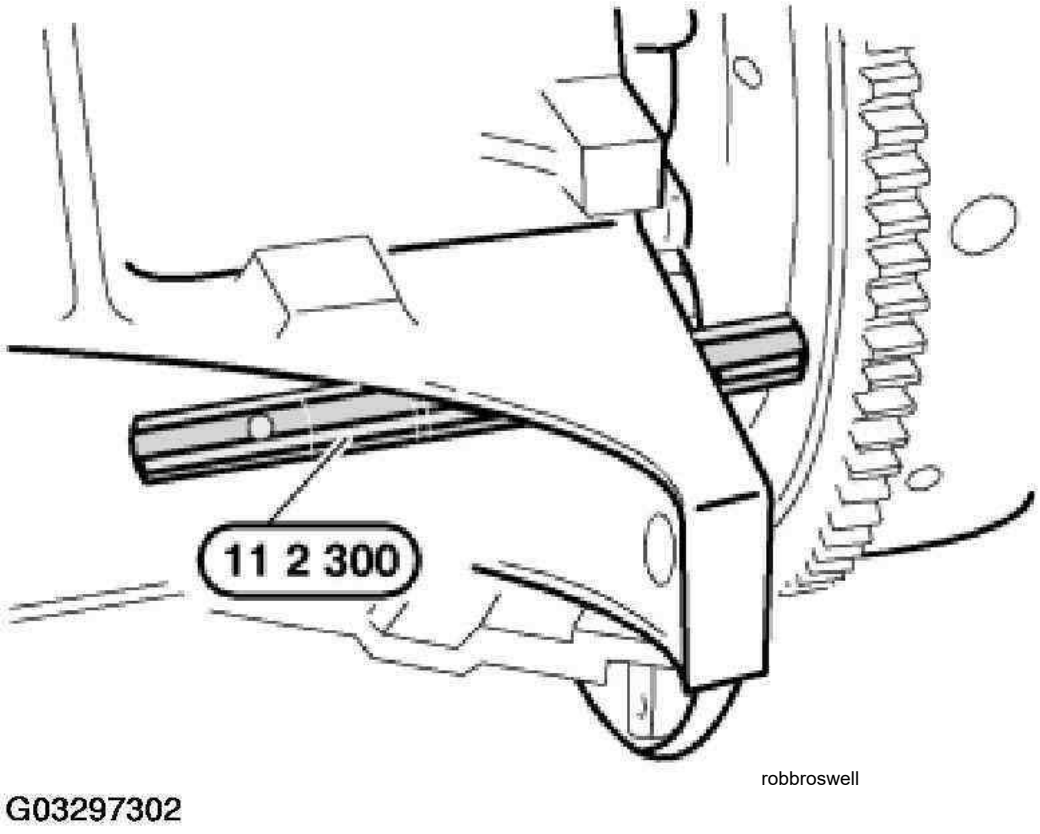


Fig. 250: Removing Special Tool 11 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten and remove special tool 11 4 220.

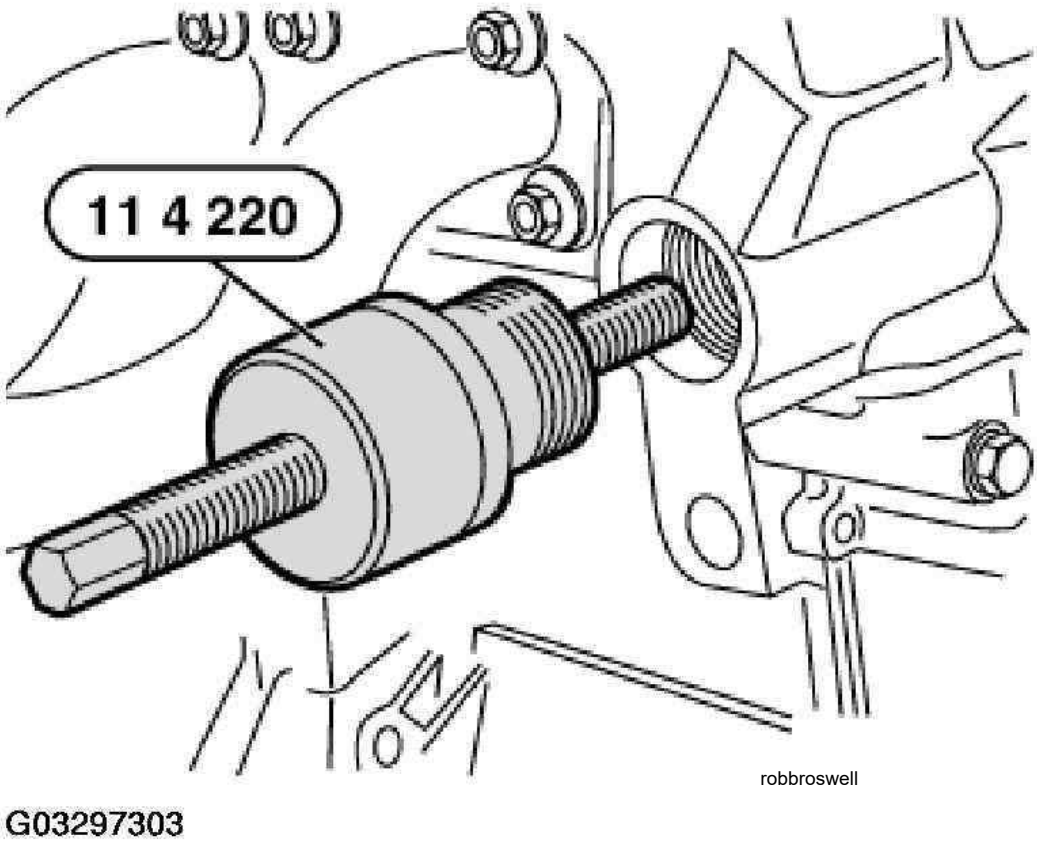


Fig. 251: Removing Special Tool 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Install cylinder for chain tensioning piston .

Assemble engine.

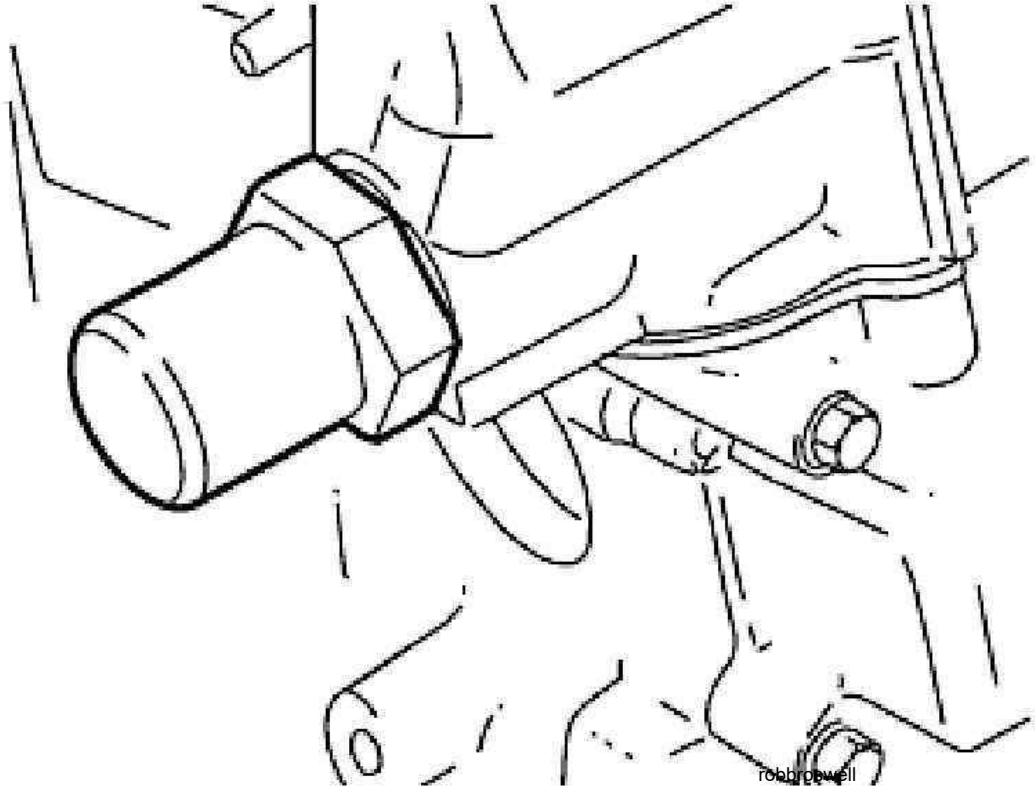


Fig. 252: Installing Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 090 REMOVING AND INSTALLING/REPLACING CHAIN TENSIONING PISTON (M52 / M52TU / M54 / M56)

IMPORTANT: Spring pressure!

Unfasten cylinder for chain tensioning piston.

Installation:

Replace sealing ring.

Tightening torque, see 11 31 8AZ in **ENGINE - TIGHTENING TORQUES** .

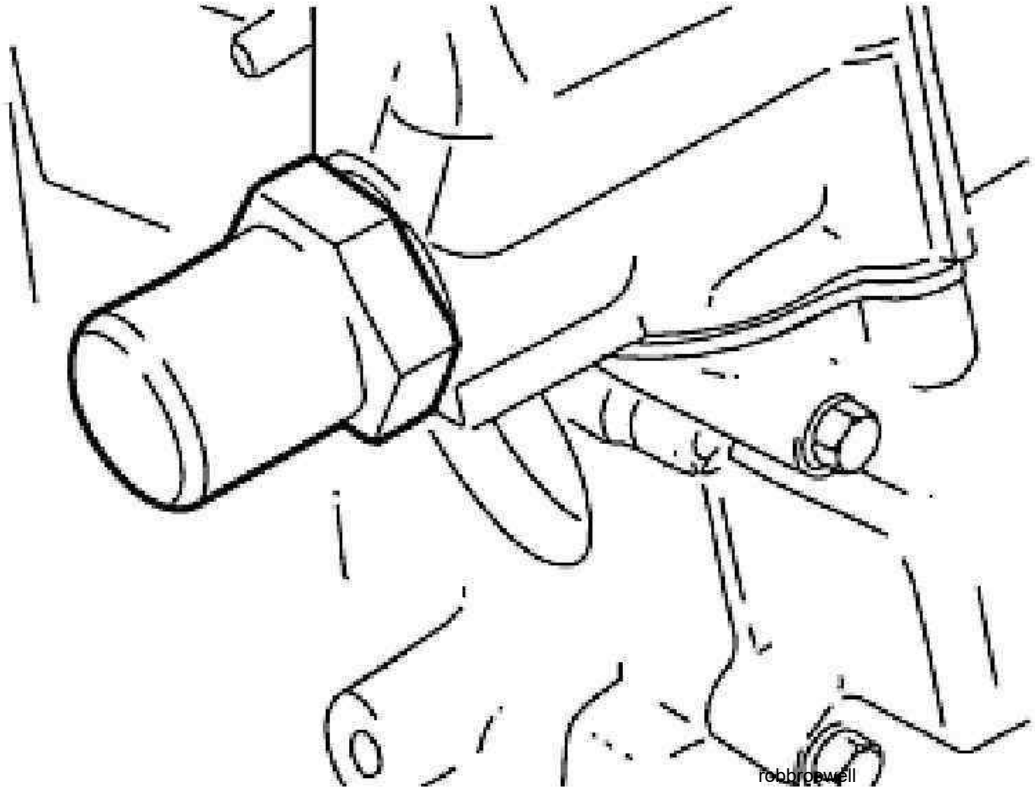
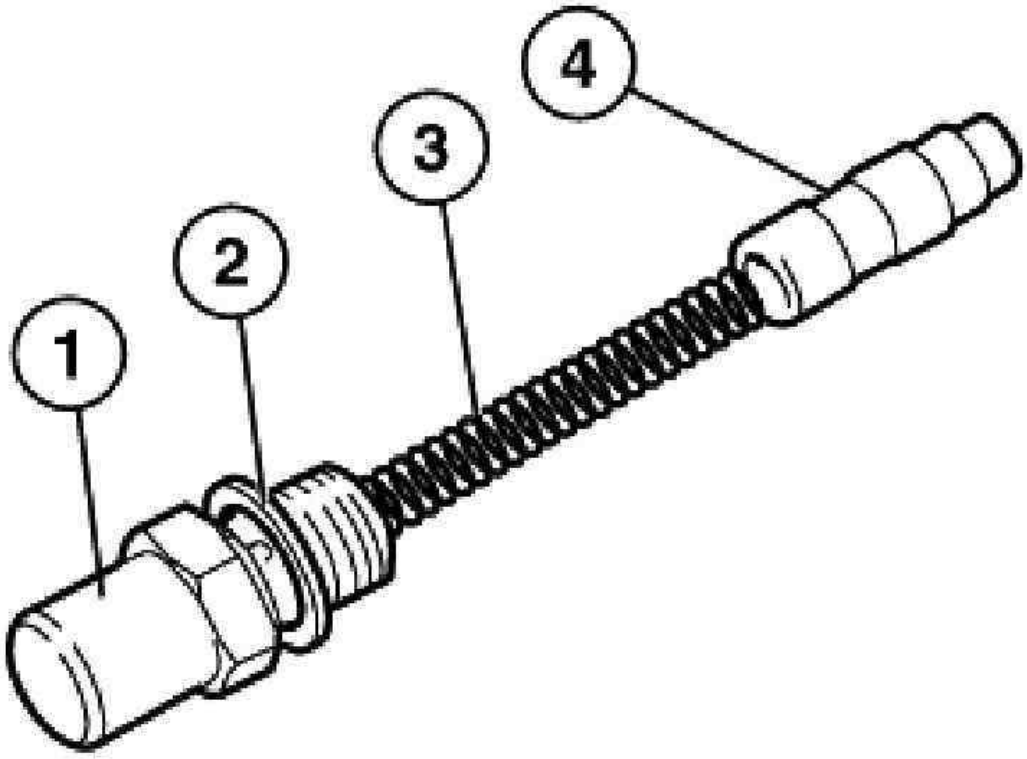


Fig. 253: Unfastening Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement of components:

1. Cylinder for chain tensioning piston
2. Sealing ring
3. Spring
4. Piston



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1) Cylinder for chain tensioning piston
2) Sealing ring
3) Spring
4) Piston

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Fig. 254: Identifying Chain Tensioning Piston Parts
Courtesy of BMW OF NORTH AMERICA, INC.

11 31 505 ADJUSTING CAMSHAFT TIMING (M52TU / M54 / M56)

Special tools required:

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 244
- 11 3 292
- 11 4 220
- 11 5 180
- 11 6 150

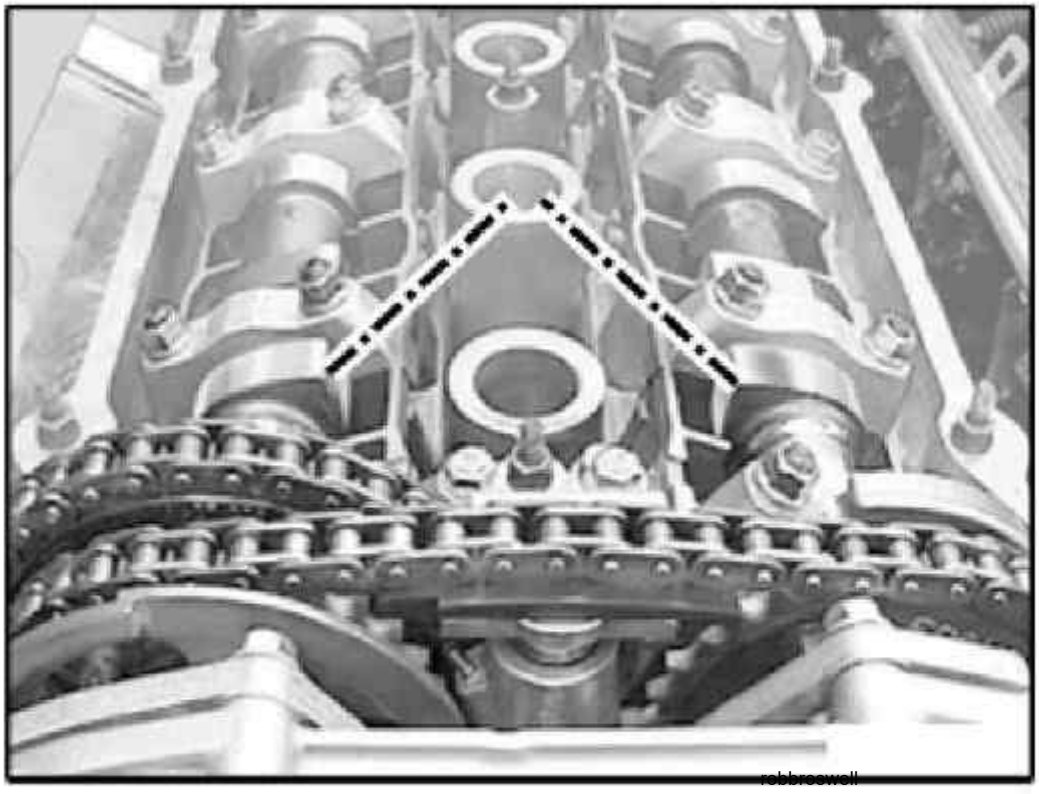
(refer to **11 31 005 CHECKING CAMSHAFT TIMING (M52TU / M54 / M56)**)

Before carrying out adjustment work:

Check camshaft timing .

Crank engine in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face one another.

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Fig. 255: Identifying Position Of Cam Tips On Inlet And Exhaust Camshafts On 1St Cylinder Face One Another
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft with special tool 11 2 300 in TDC position of 1st cylinder.

X3 only:

Secure crankshaft with special tool 11 5 180 in TDC position of 1st cylinder.

IMPORTANT: Do not turn the engine back.
Remove special tools 11 2 300 / 11 5 180 before starting engine.

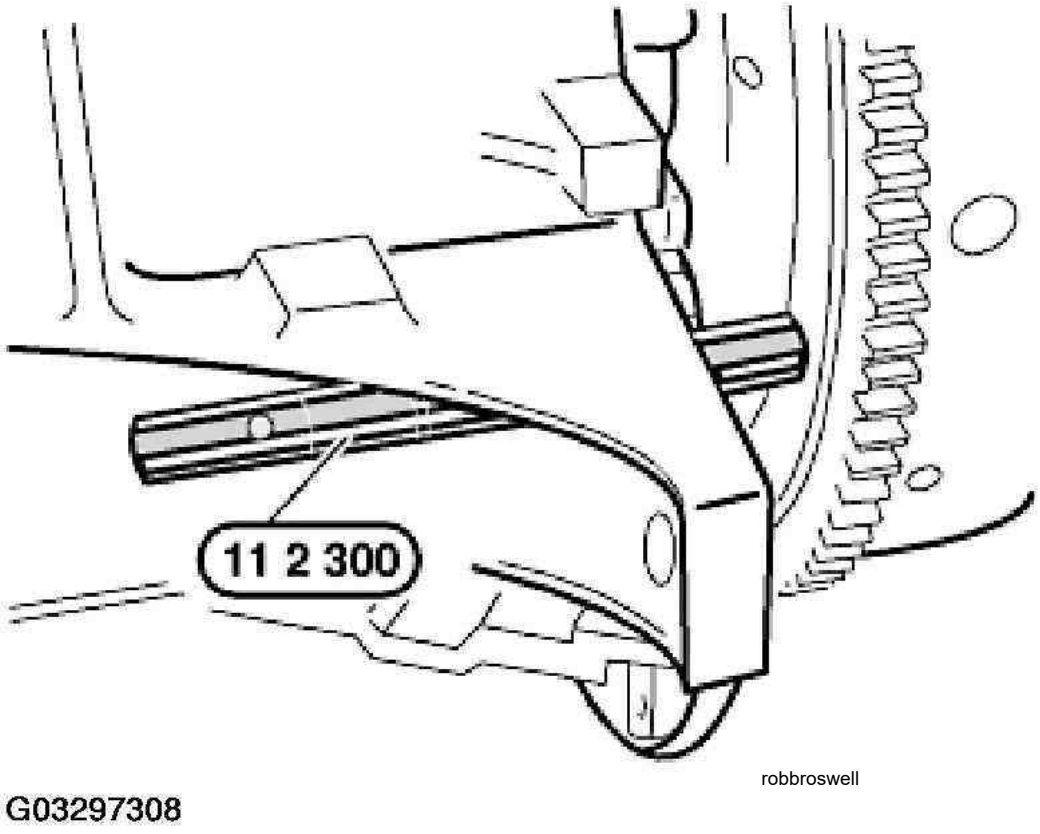


Fig. 256: Securing Crankshaft With Special Tool 11 2 300 In TDC Position Of 1St Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

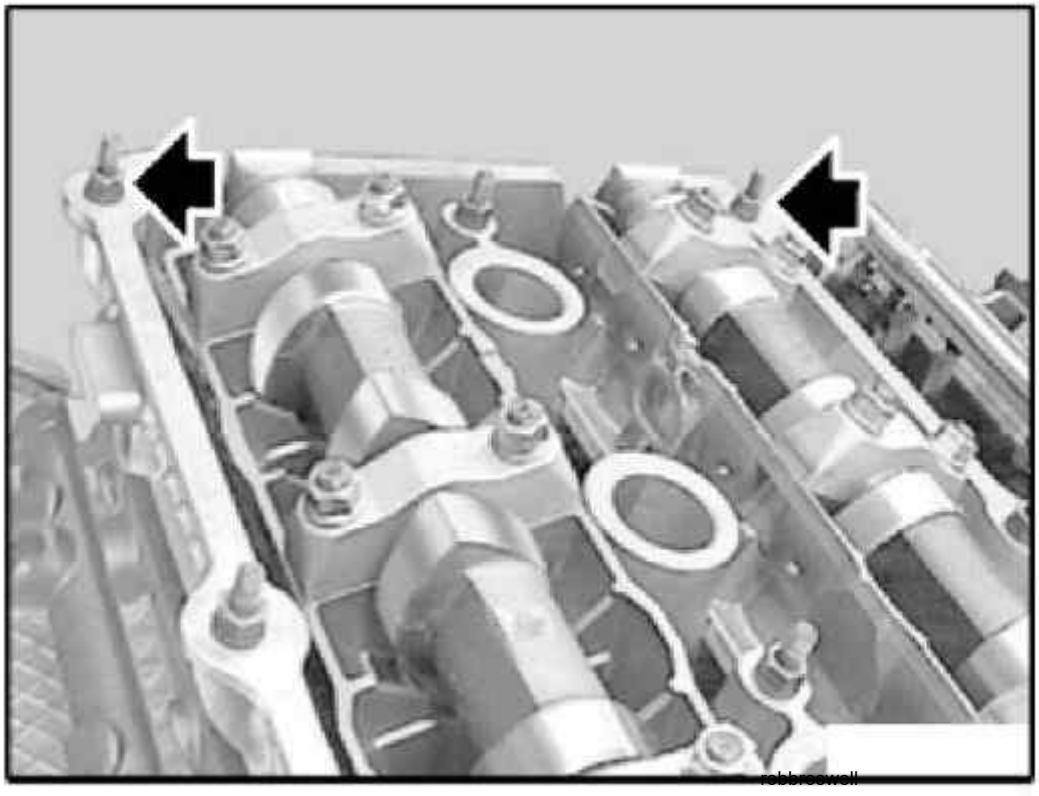


Fig. 257: Unscrewing Studs
Courtesy of BMW OF NORTH AMERICA, INC.

Remove double VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

Press down top of chain tensioner and lock off with special tool 11 3 292.

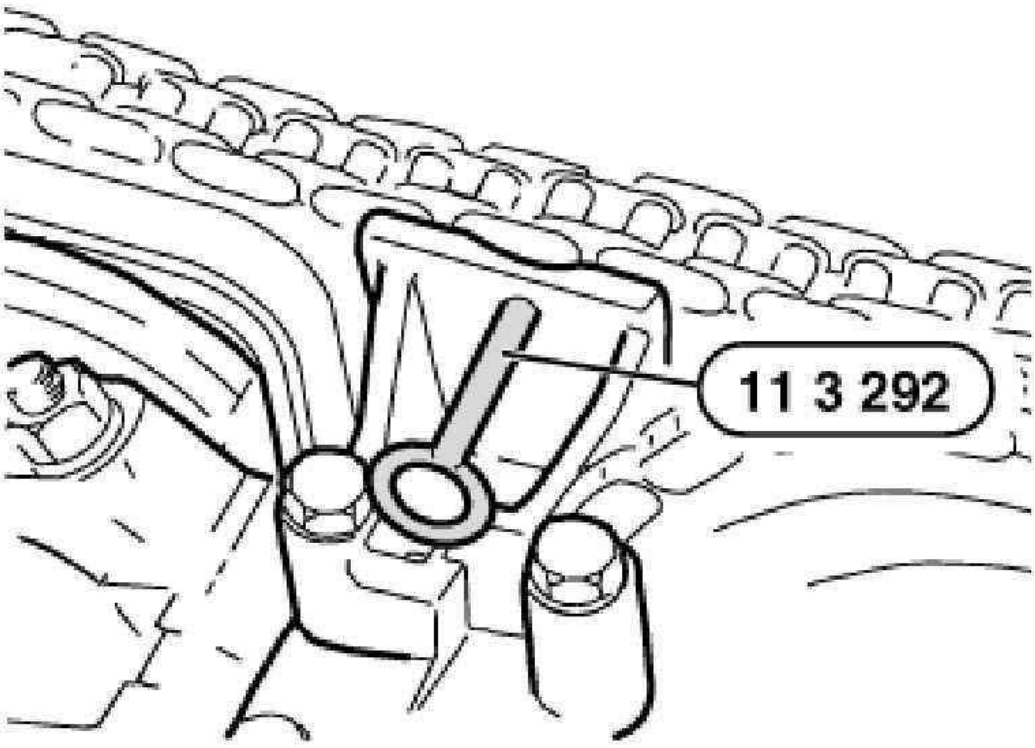


Fig. 258: Pressing Down Top Of Chain Tensioner And Locking With Special Tool 11 3 292
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cylinder for chain tensioning piston is under spring pressure.

Remove cylinder for chain tensioning piston.

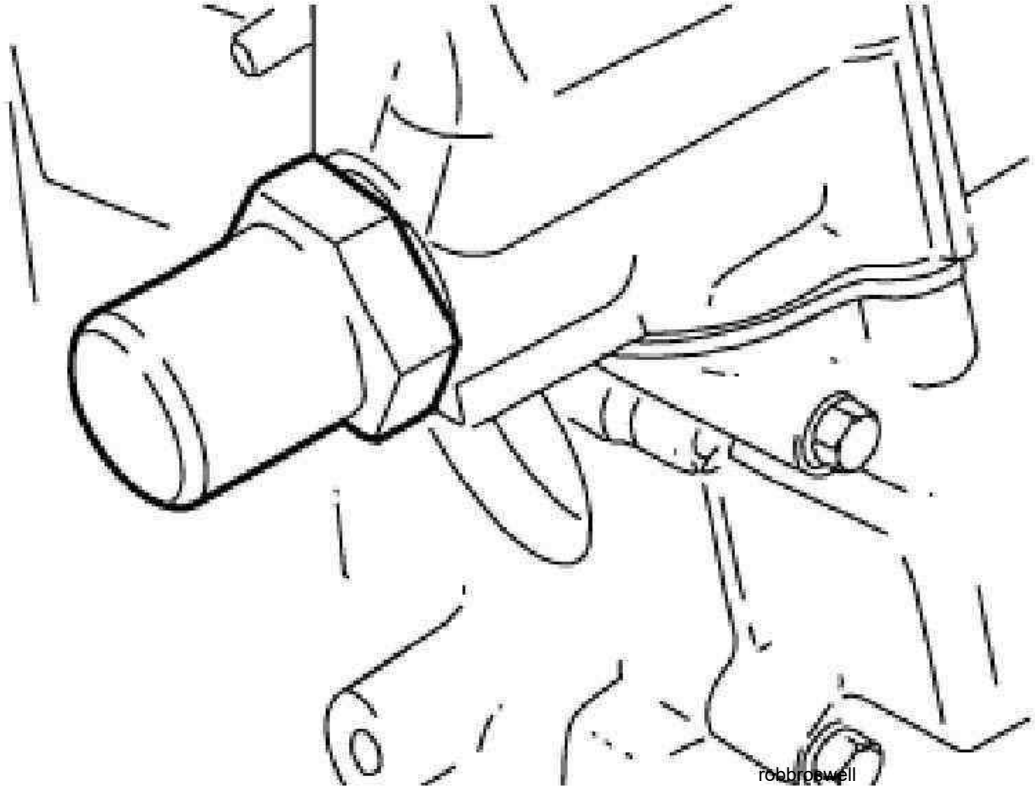


Fig. 259: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Install special tool 11 4 220.

Fit adjusting screw to bow cover.

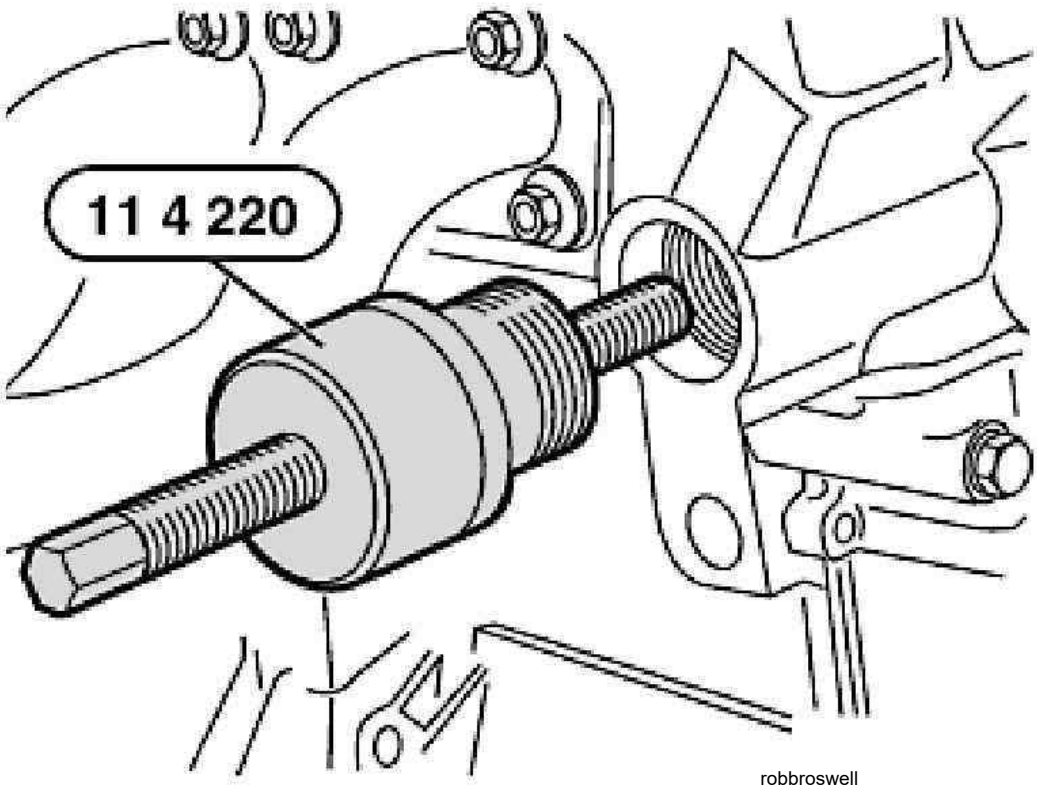


Fig. 260: Installing Special Tool 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Release screws (1) by half a turn.

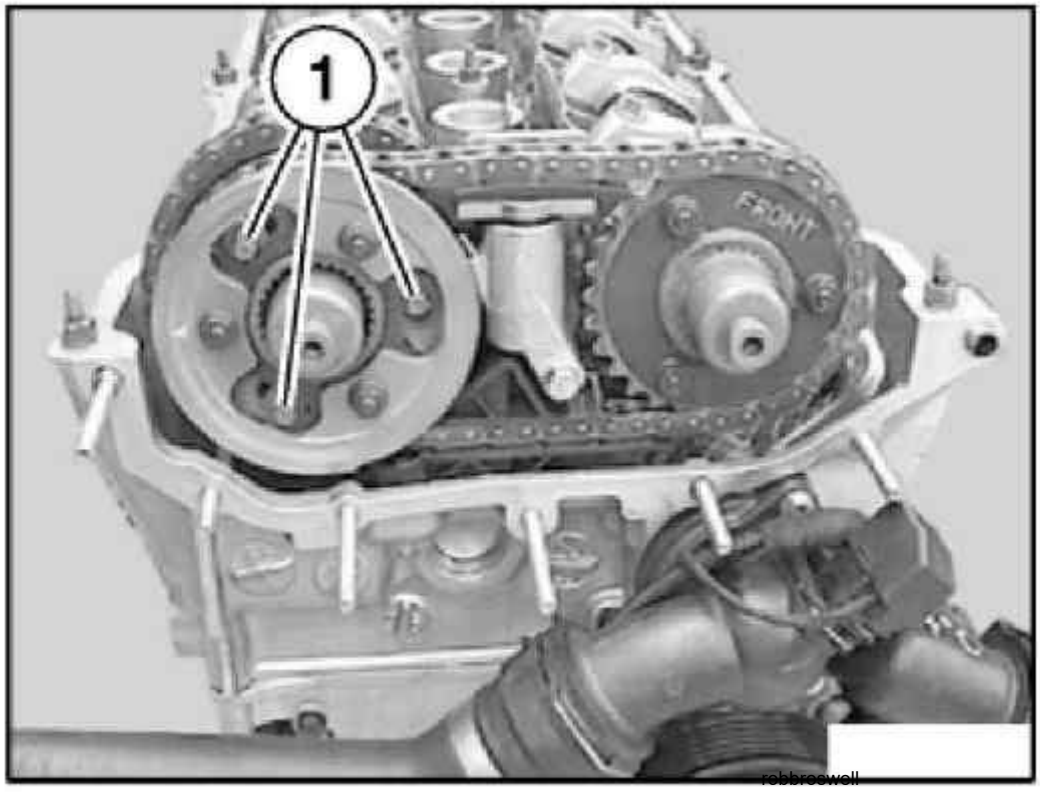


Fig. 261: Releasing Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts (2) by two turns.

Release nuts (3) by one turn.

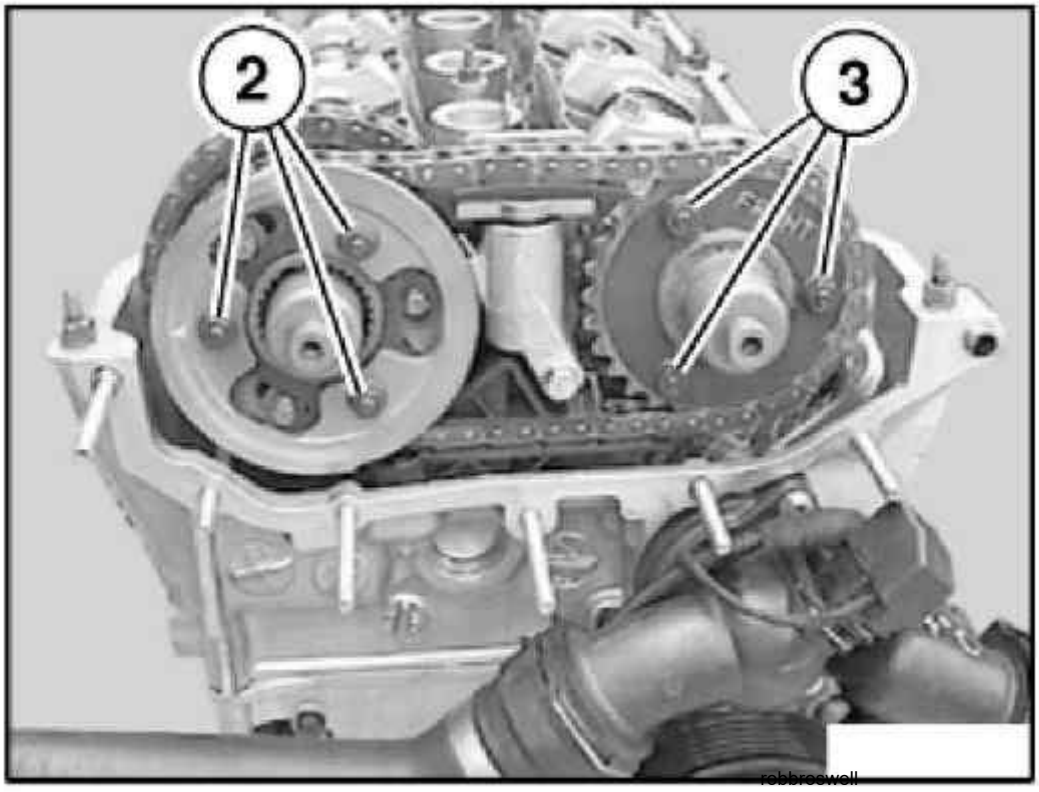


Fig. 262: Releasing Nuts
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Toothed shaft (4) slips very easily from splines.

Pull out toothed shaft (4) until approx. 1 mm of splines can be seen.

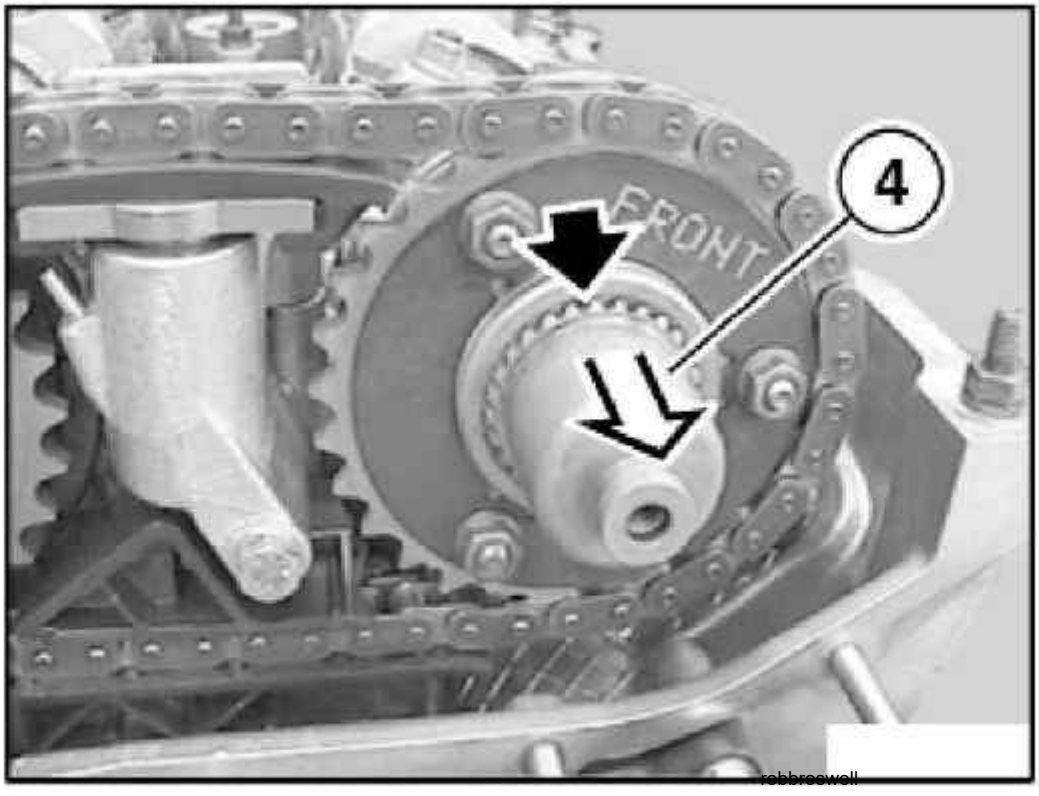
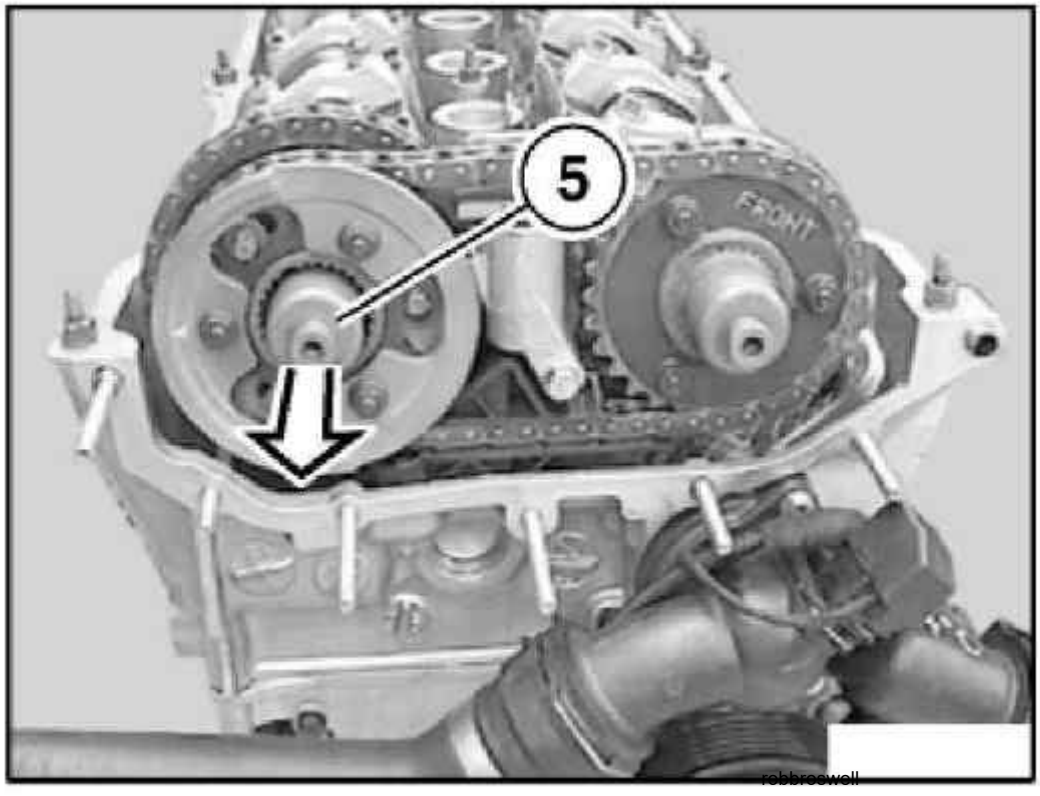


Fig. 263: Pulling Out Toothed Shaft
Courtesy of BMW OF NORTH AMERICA, INC.

Withdraw toothed shaft (5) up to stop.



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Fig. 264: Withdrawing Toothed Shaft Up To Stop
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 240 to camshafts on cylinder 6. Align camshafts so that special tool 11 3 240 rests without gaps on cylinder head.

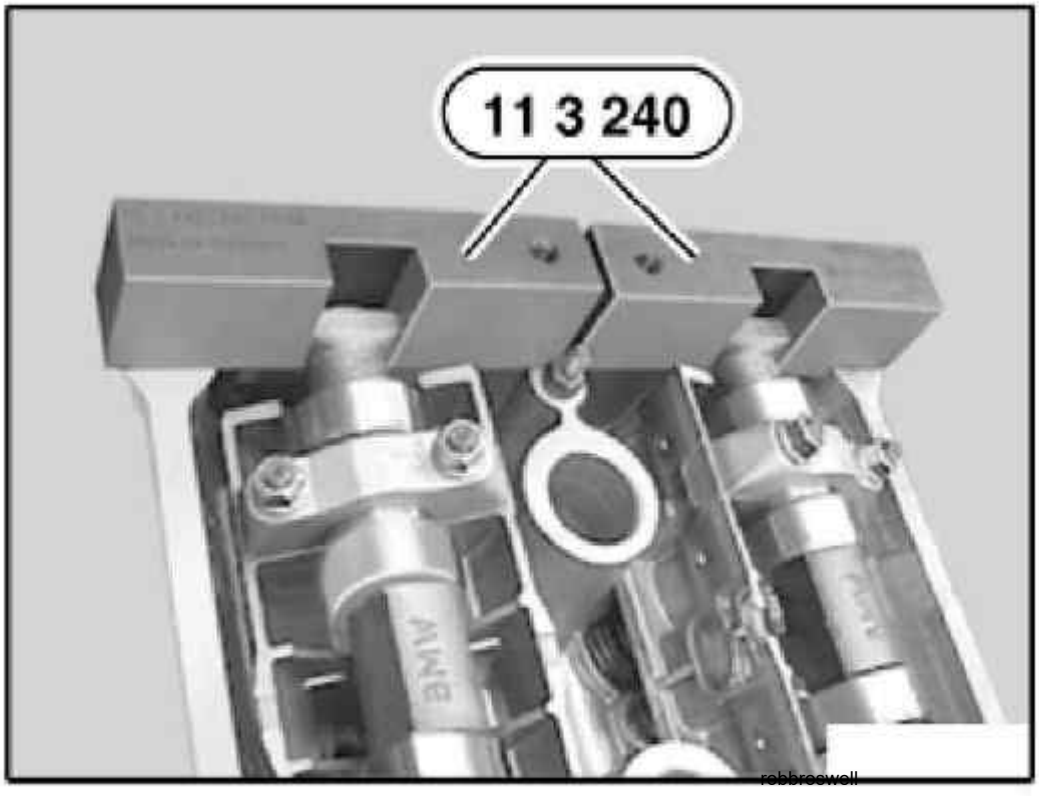


Fig. 265: Fitting Special Tool 11 3 240 To Camshafts On Cylinder 6
Courtesy of BMW OF NORTH AMERICA, INC.

Attach special tool 11 3 244 to special tool 11 3 240 and locate by way of spark plug thread.

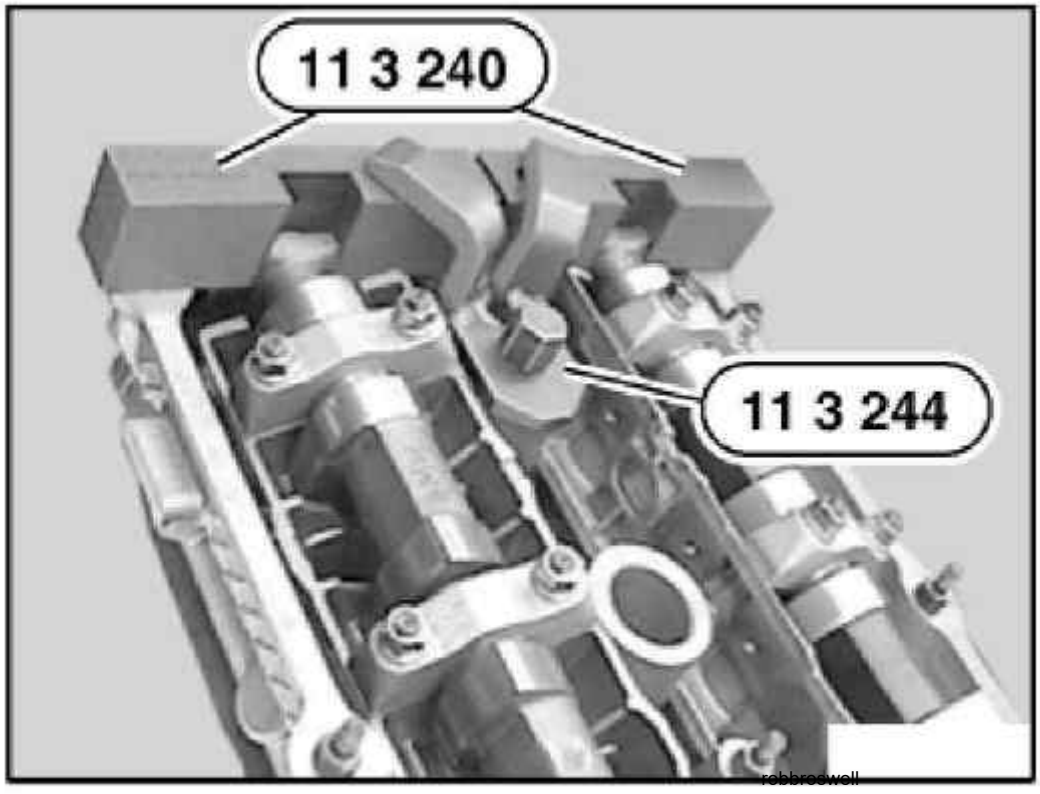


Fig. 266: Attaching Special Tool 11 3 244 To Special Tool 11 3 240
Courtesy of BMW OF NORTH AMERICA, INC.

Press down chain tensioner at top and remove special tool 11 3 292.

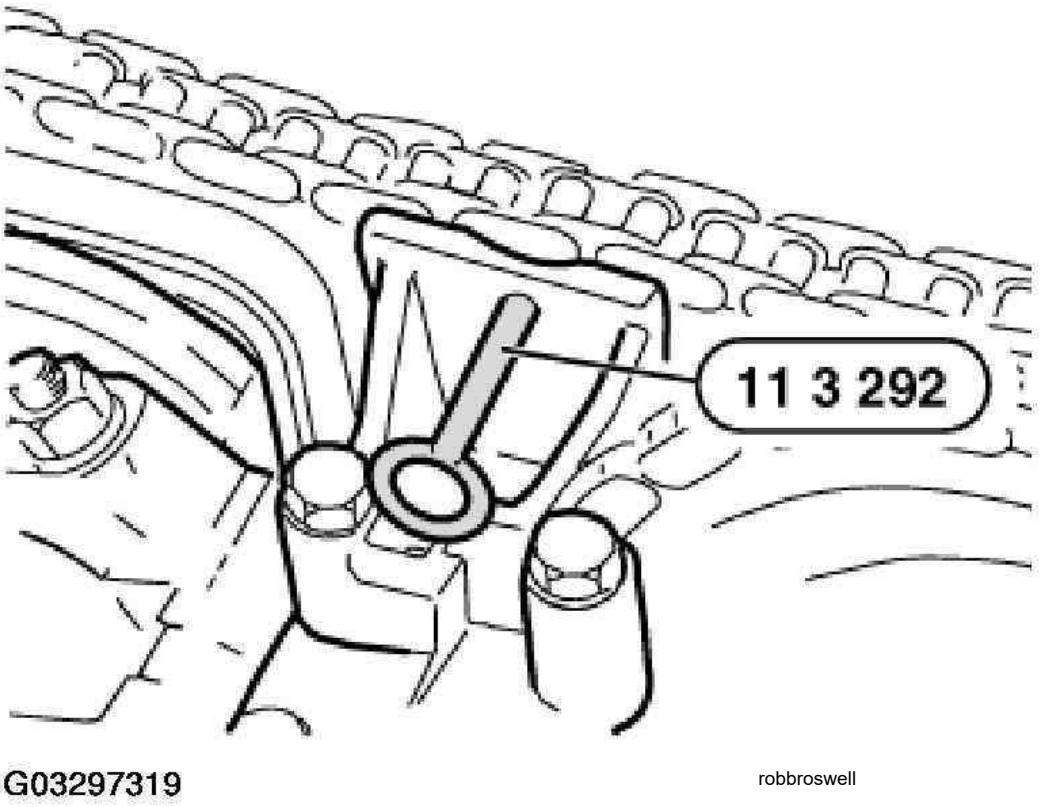


Fig. 267: Pressing Down Chain Tensioner At Top And Removing Special Tool 11 3 292
Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 Nm.

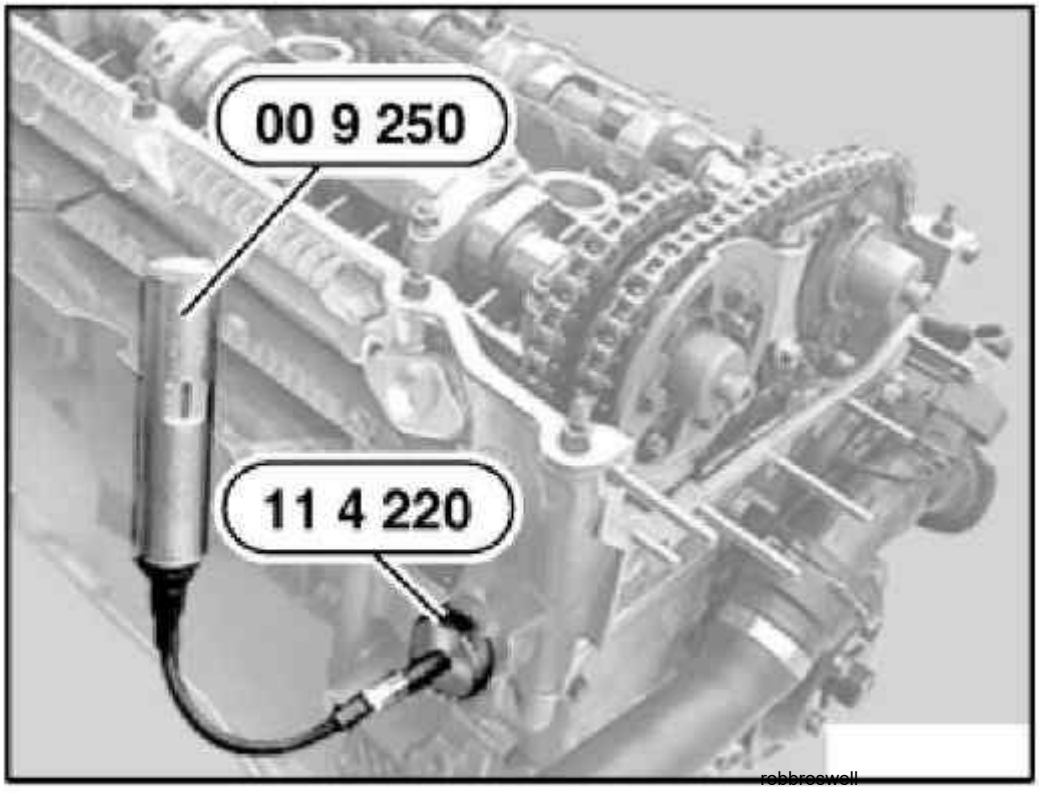
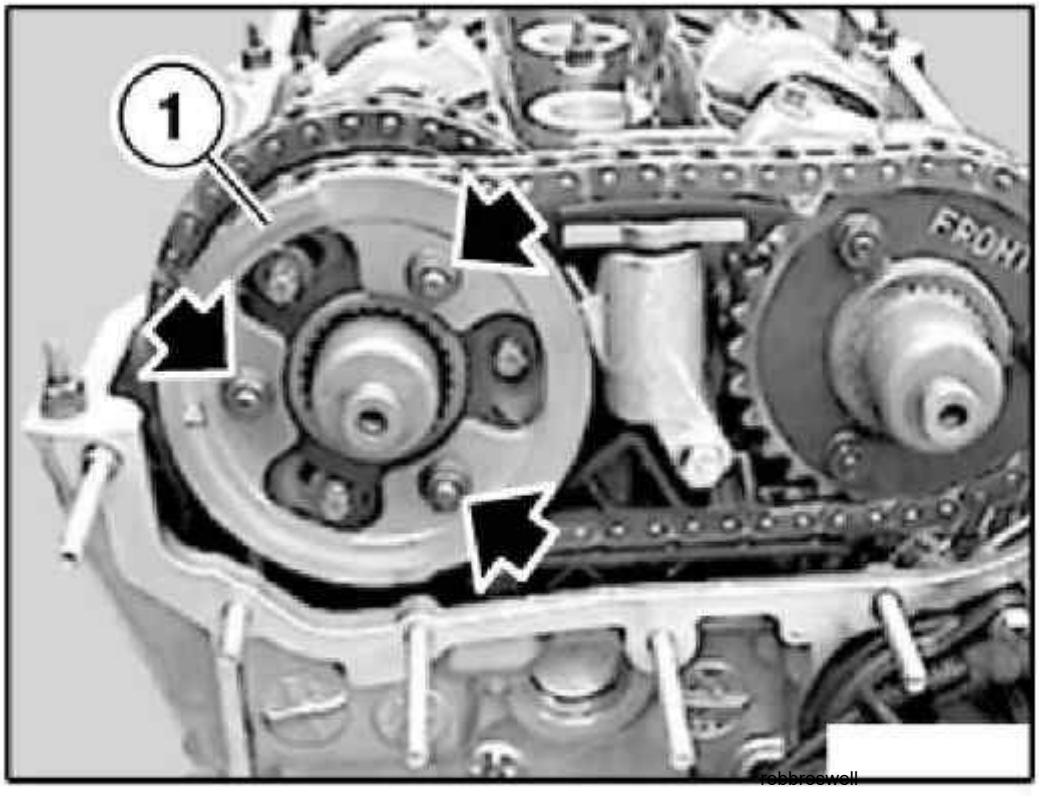


Fig. 268: Preloading Tensioning Rail With Special Tool 11 4 220 By Rotating Adjusting Screw
Courtesy of BMW OF NORTH AMERICA, INC.

Preload cup spring slightly by pressing on sensor gear (1) and tighten nuts by hand.

IMPORTANT: Do not tighten down nuts fully.



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Fig. 269: Preloading Cup Spring Slightly By Pressing On Sensor Gear
Courtesy of BMW OF NORTH AMERICA, INC.

Remove gasket.

Check dowel sleeves (1) for damage and correct installation position.

Keep sealing face clean and free of oil.

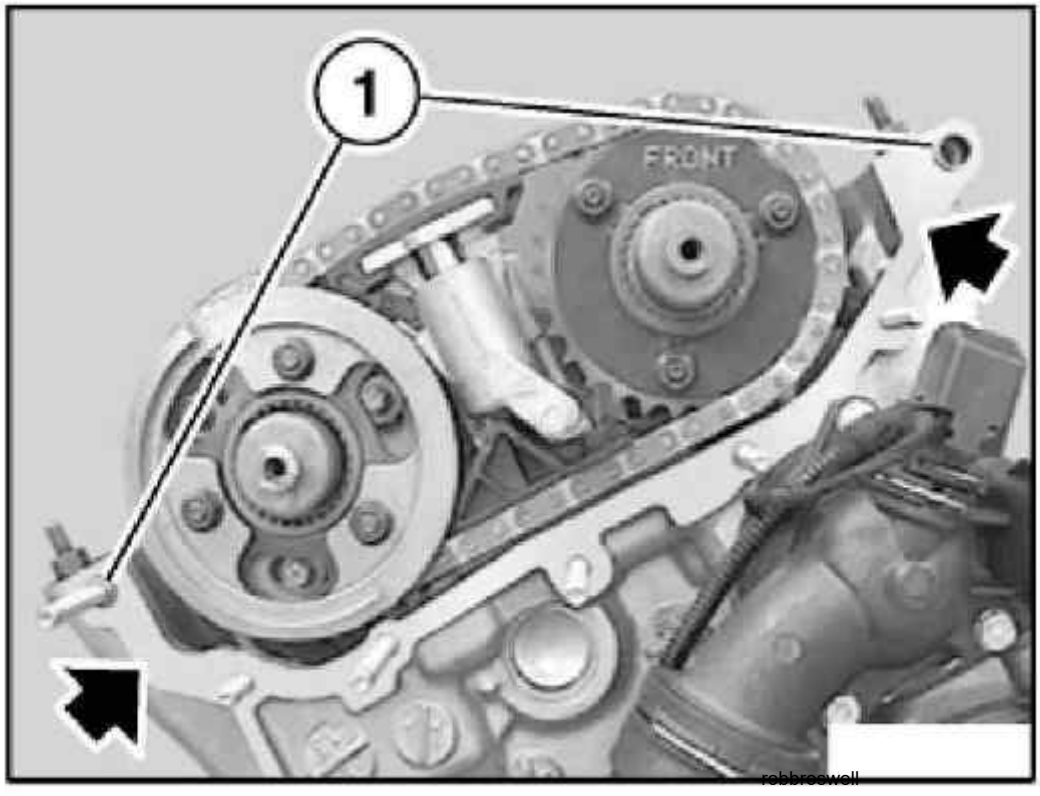


Fig. 270: Checking Dowel Sleeves For Damage
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Fit special tool 11 6 150 "without gasket" only.

If gasket remains underneath special tool 11 6 150, camshaft timing will be "incorrectly" set.

Attach special tool 11 6 150 "without gasket", tighten nuts by hand and then tighten down uniformly until special tool 11 6 150 is in full contact with cylinder head.

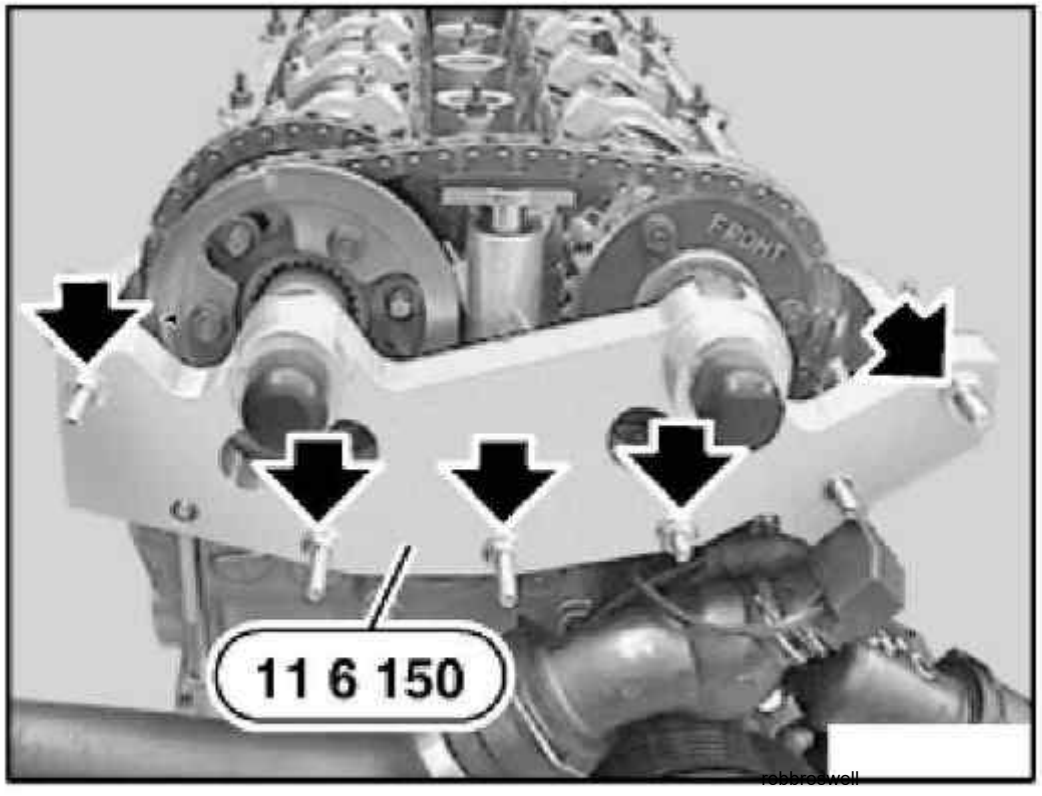


Fig. 271: Attaching Special Tool 11 6 150 To Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screws (1) on exhaust side and initially tighten to approx.

5 Nm

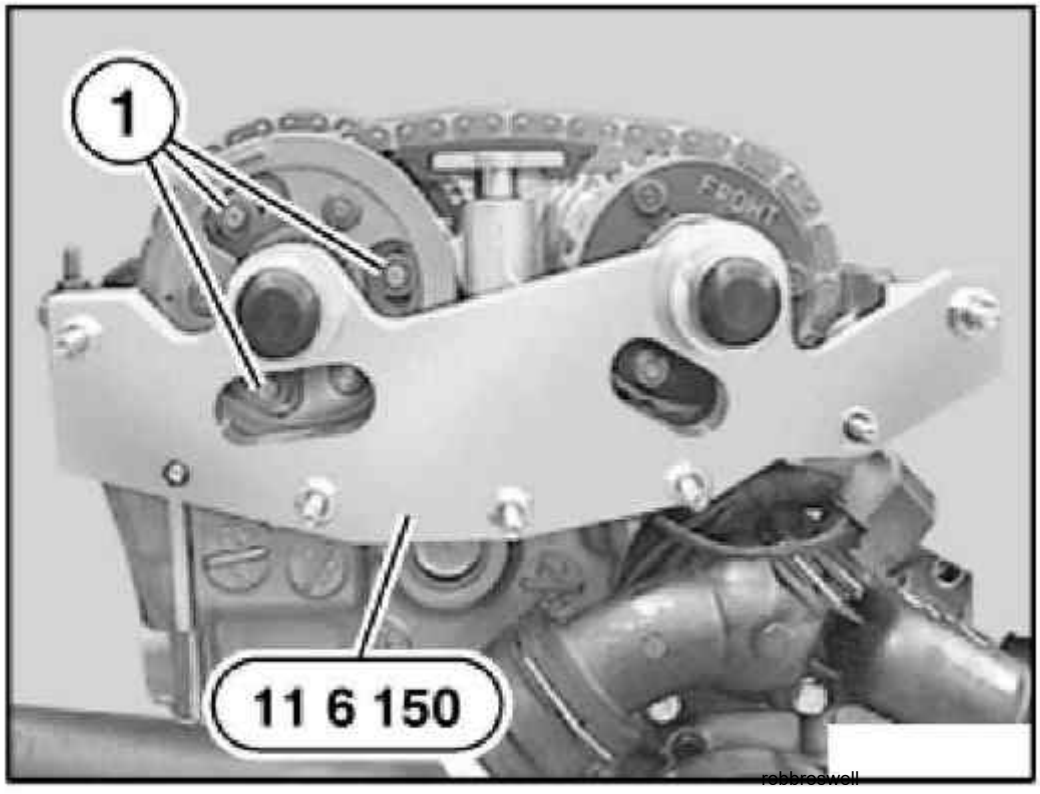


Fig. 272: Tightening Screws On Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Initially tighten nuts (2) on exhaust side and nuts (3) on inlet side to approx. 5 Nm.

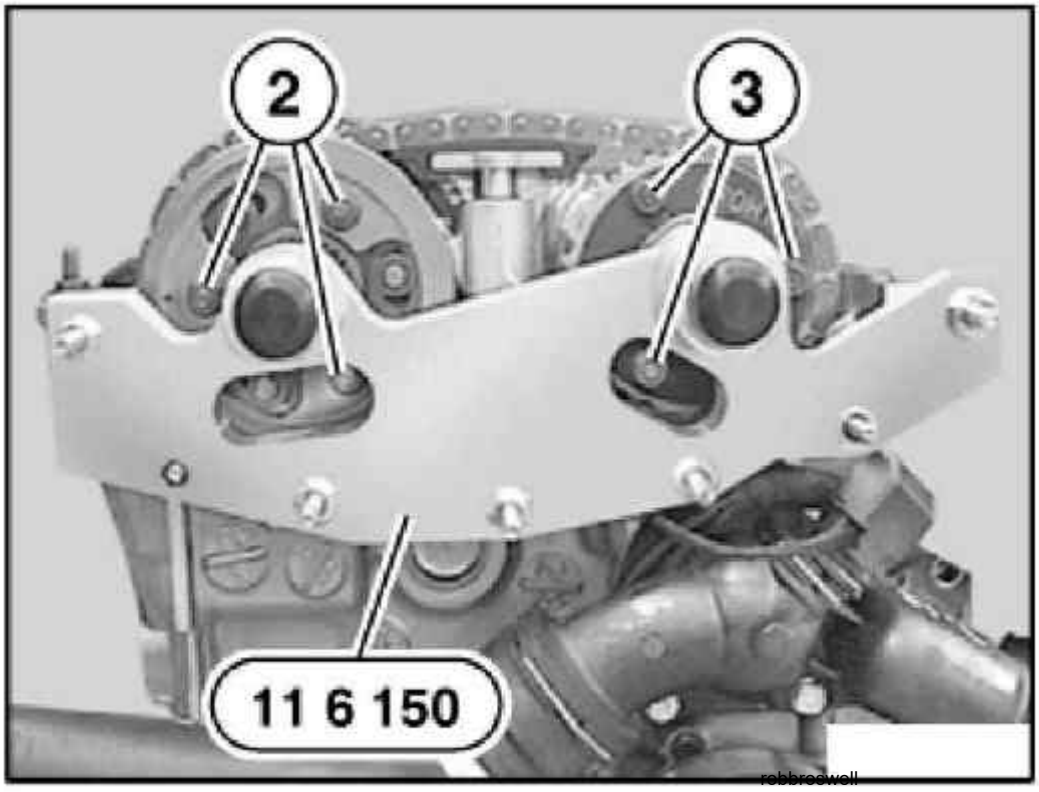
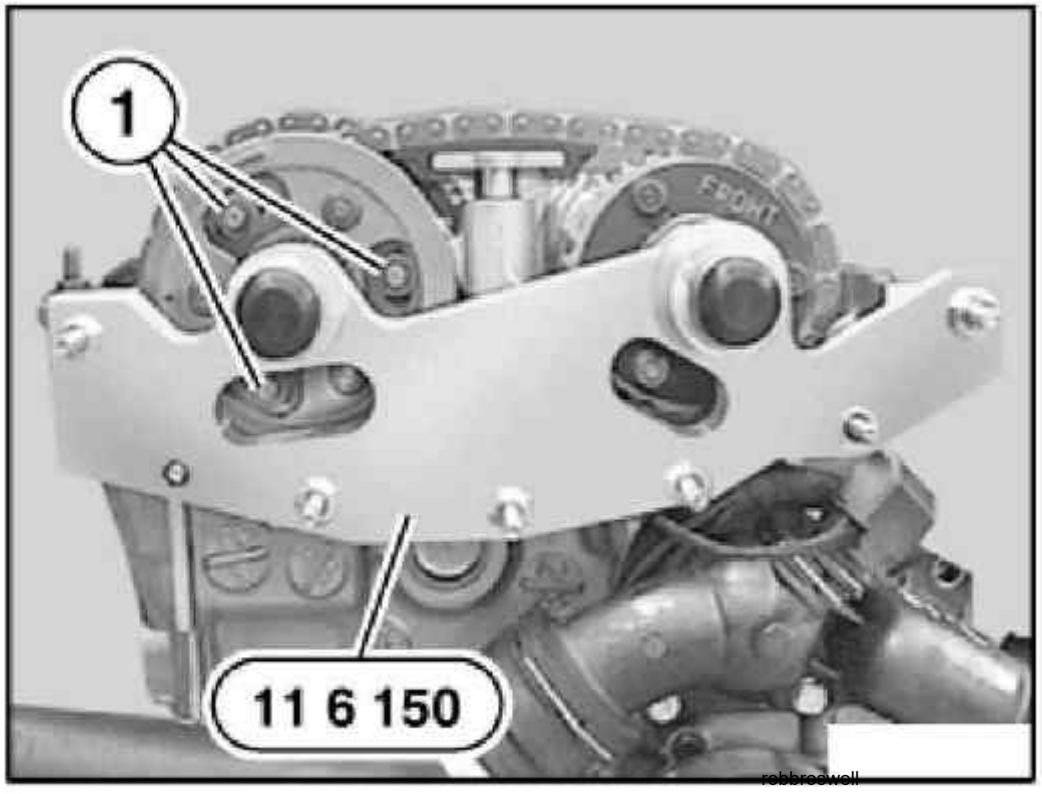


Fig. 273: Tightening Nuts Of Exhaust Side And Of Inlet Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down screws (1) on exhaust side.

Tightening torque, see 11 31 3AZ in **ENGINE - TIGHTENING TORQUES** .



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Fig. 274: Tightening Screws Of Exhaust Side
Courtesy of BMW OF NORTH AMERICA, INC.

Tighten down nuts (2) on exhaust side and nuts (3) on inlet side.

Tightening torque, see 11 31 11AZ in **ENGINE - TIGHTENING TORQUES** .

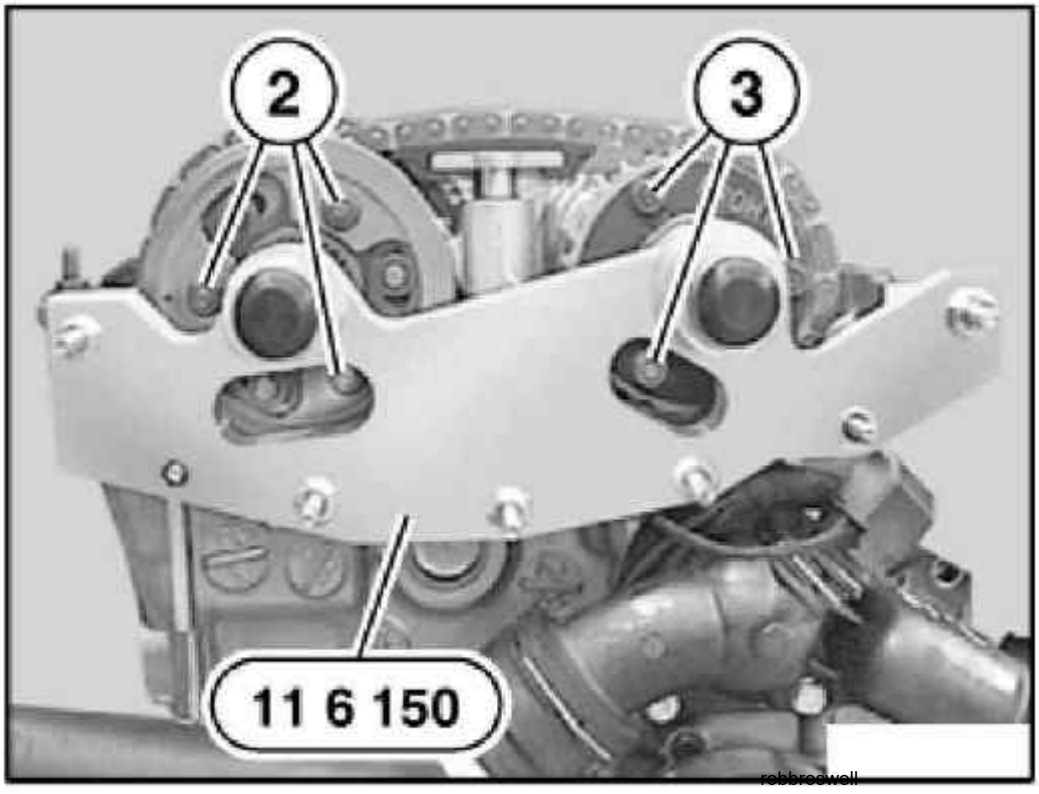


Fig. 275: Tightening Nuts Of Exhaust Side And Nuts Of Inlet Side
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 / 11 5 180 back until flywheel is no longer secured.

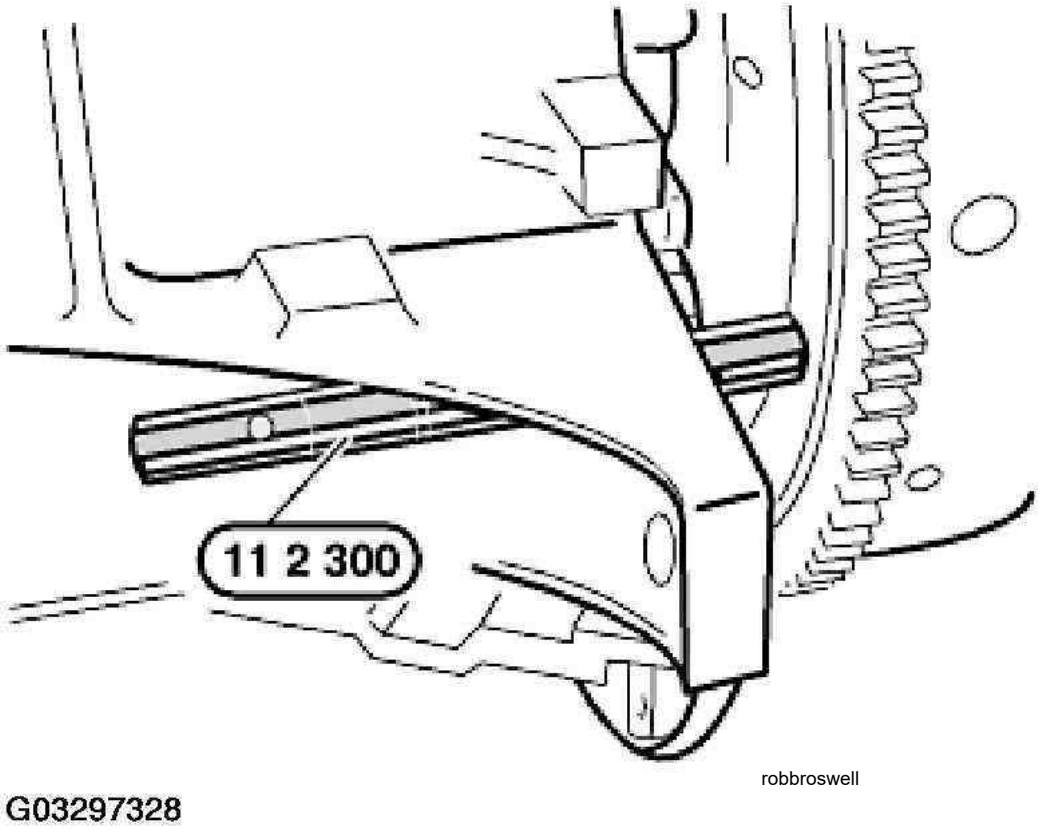


Fig. 276: Pulling Special Tool 11 2 300/11 5 180 Back Until Flywheel Secured
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 244 and special tool 11 3 240.

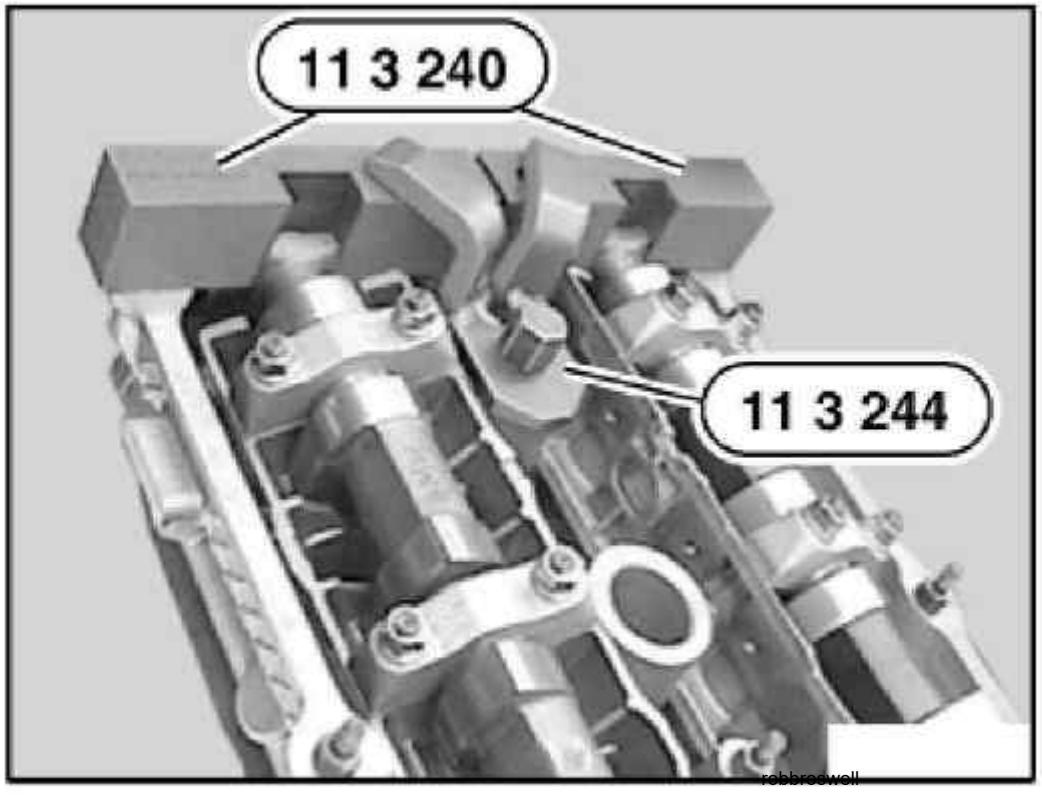
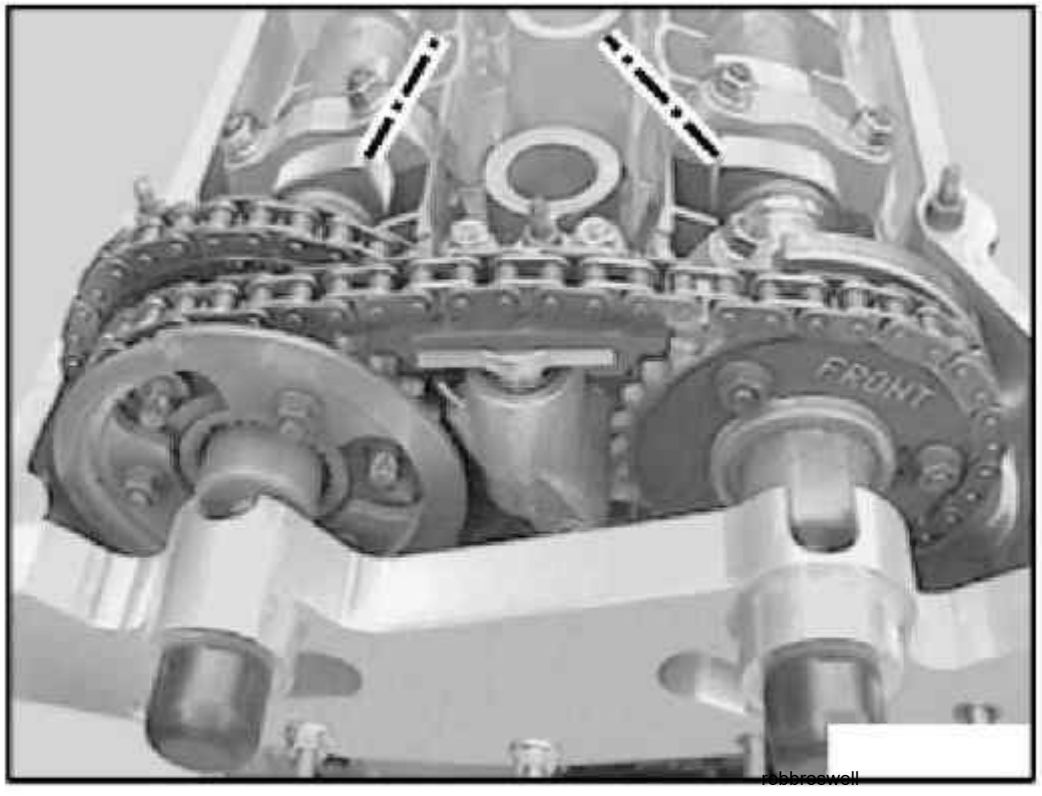


Fig. 277: Removing Special Tool 11 3 244 And Special Tool 11 3 240
Courtesy of BMW OF NORTH AMERICA, INC.

Crank engine twice in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face one another.



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Fig. 278: Identifying Position Of Cam Tips On Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300.

X3 only:

Secure crankshaft with special tool 11 5 180 in TDC position of 1st cylinder.

IMPORTANT: Do not turn the engine back.
Remove special tools 11 2 300 / 11 5 180 before starting engine.

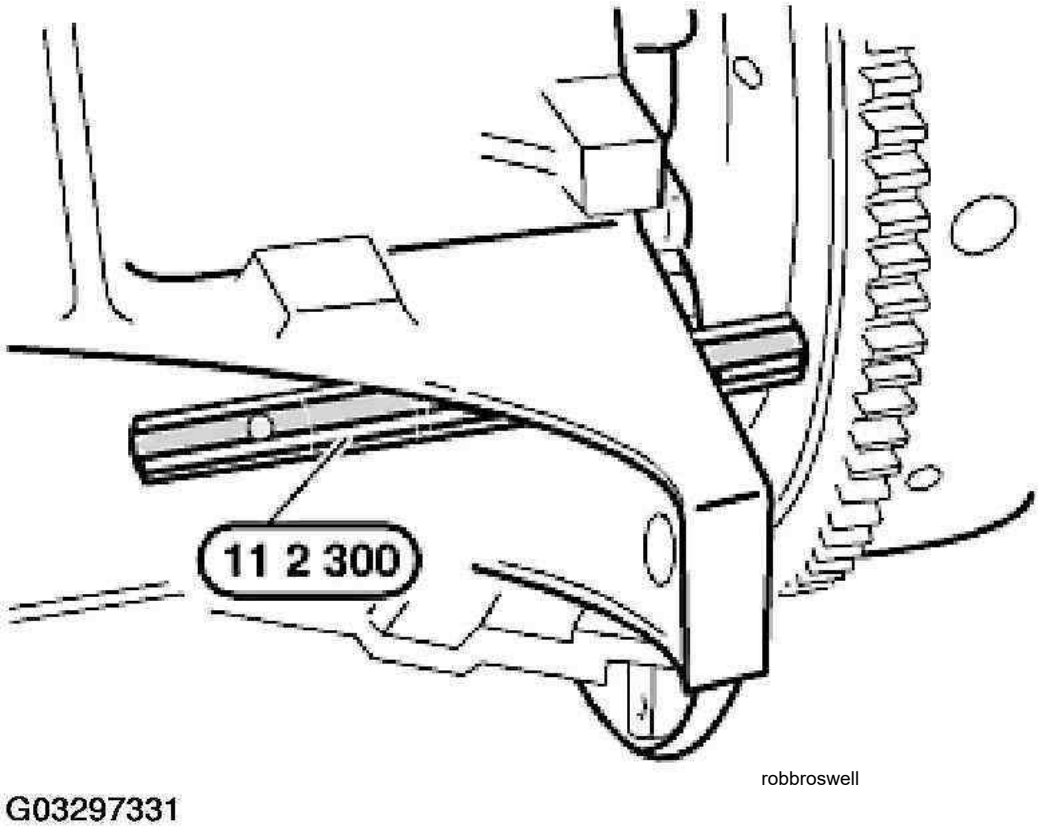


Fig. 279: Securing Crankshaft In TDC Position
Courtesy of BMW OF NORTH AMERICA, INC.

Fit special tool 11 3 240 to camshafts.

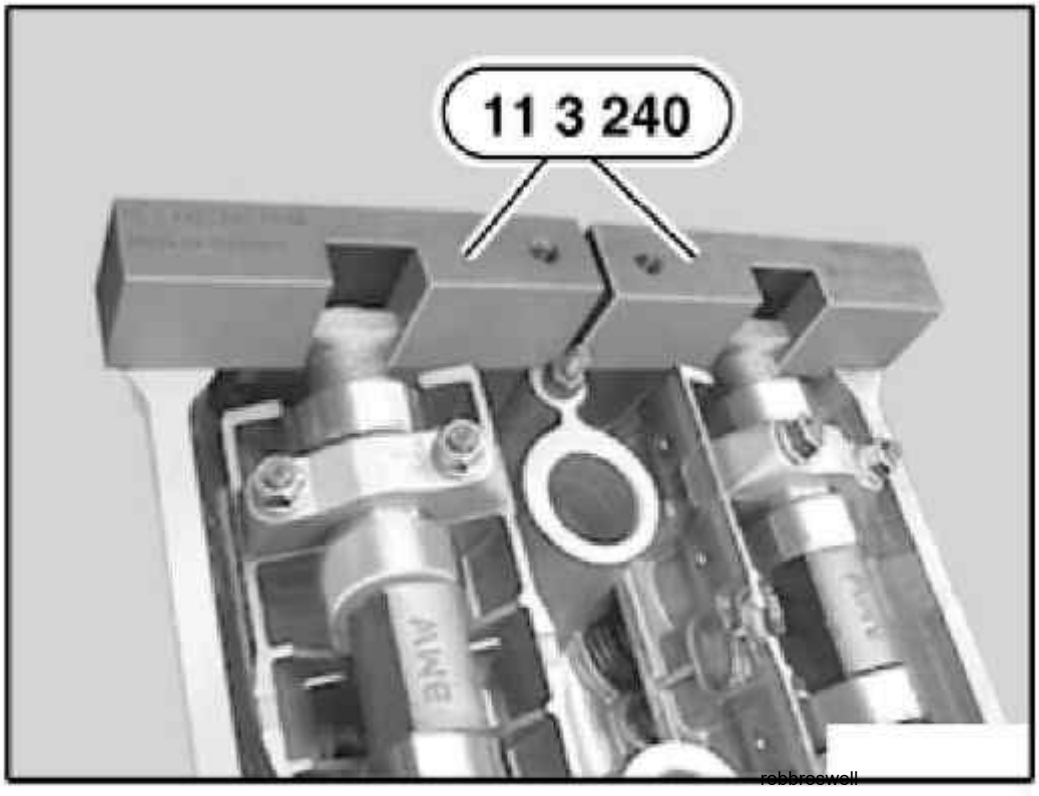


Fig. 280: Fitting Special Tool 11 3 240 To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side.**
The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.

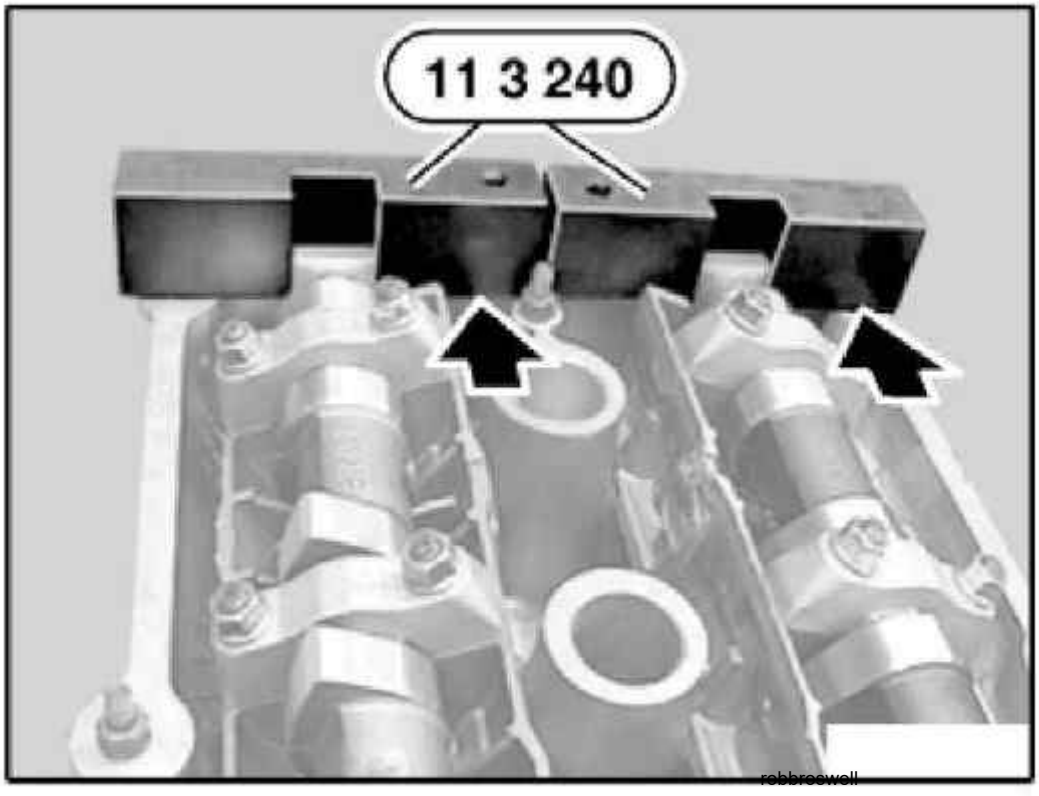


Fig. 281: Special Tool 11 3 240 Without Gap On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten and remove special tool 11 4 220.

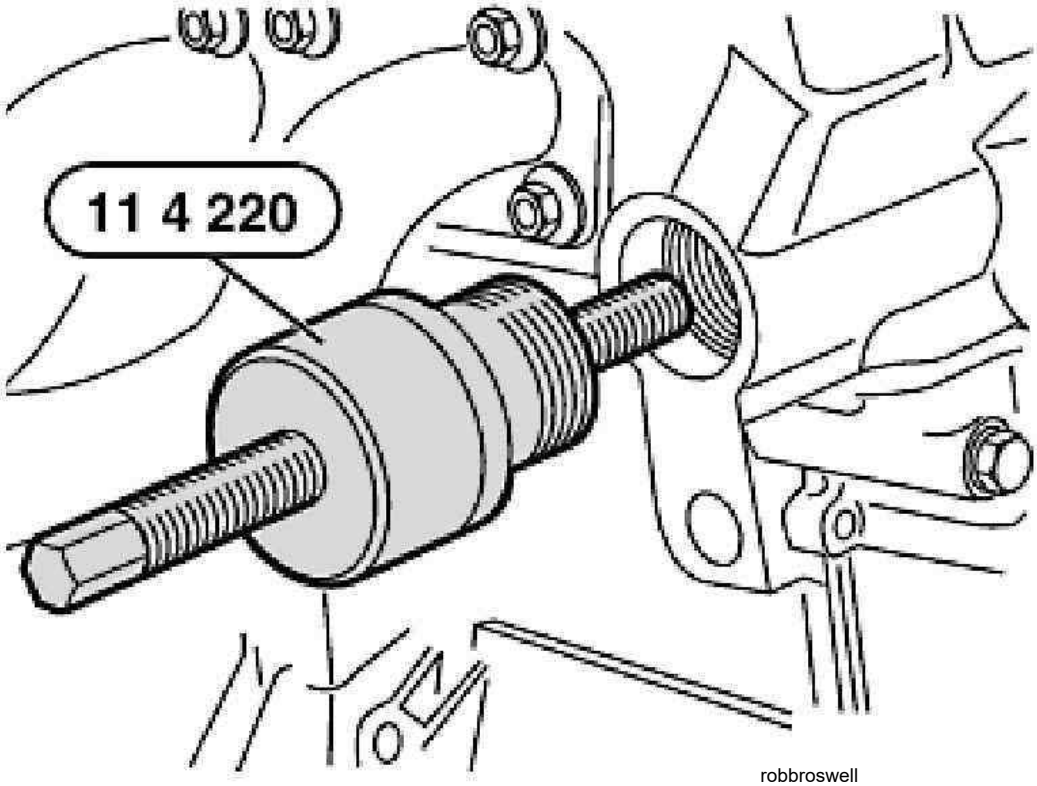


Fig. 282: Removing Special Tool 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Install cylinder for chain tensioning piston .

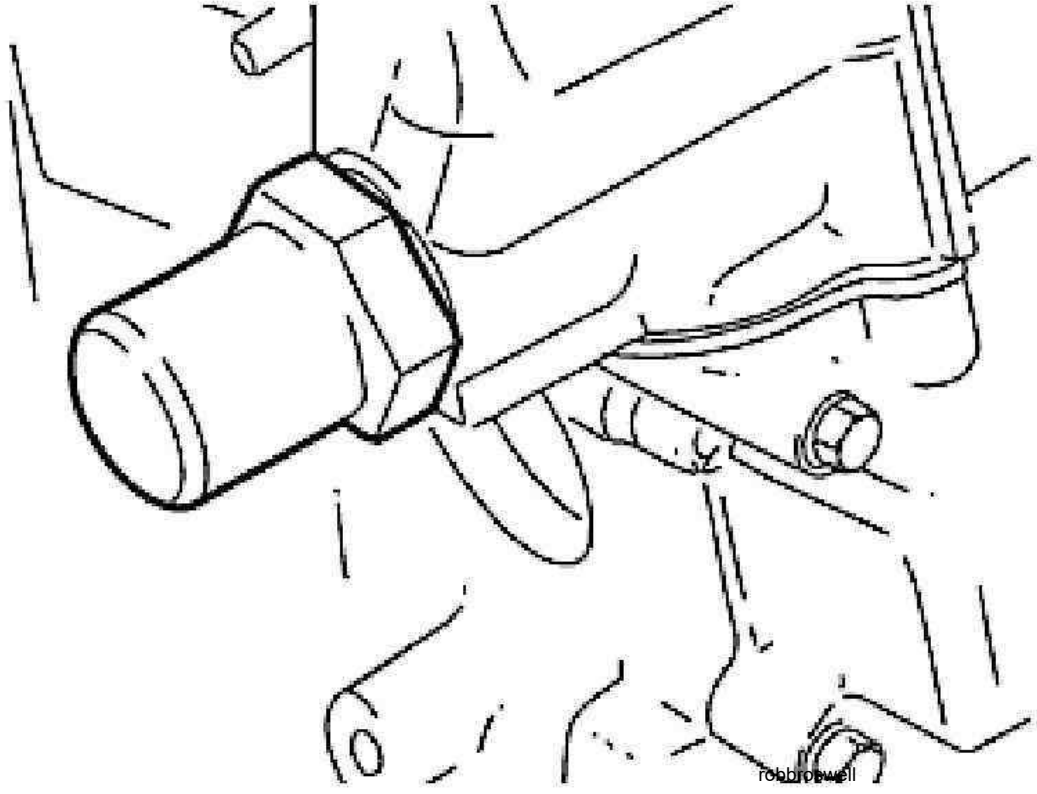


Fig. 283: Installing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 2 300 / 11 5 180.

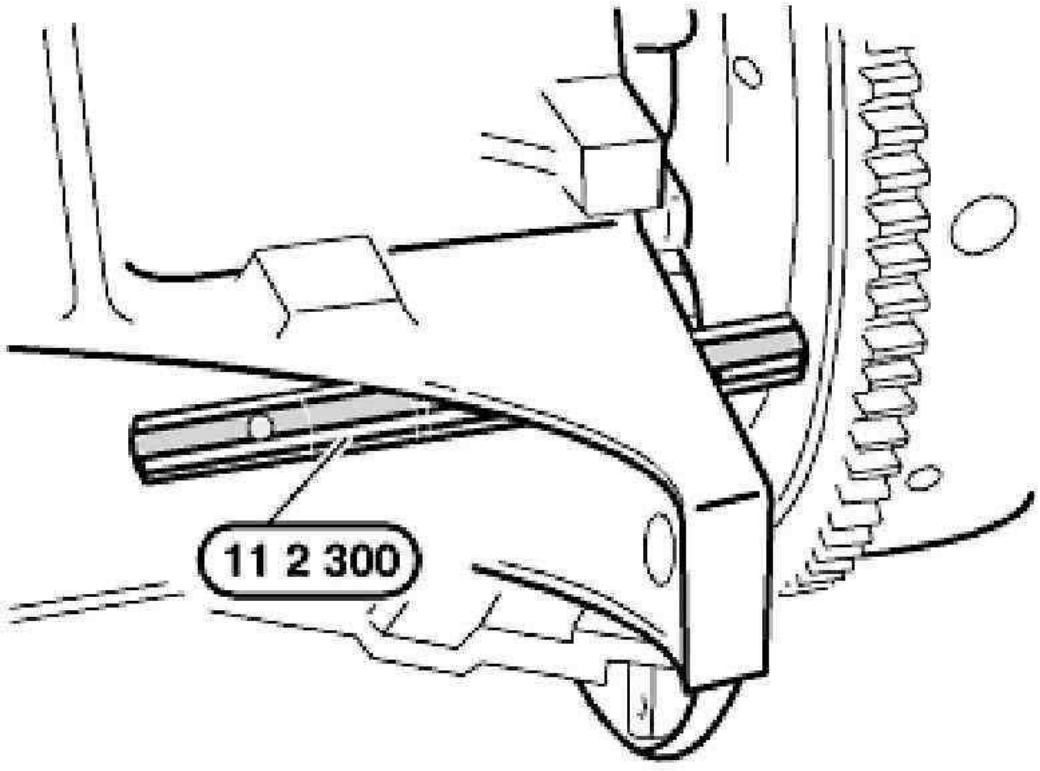


Fig. 284: Removing Special Tool 11 2 300/11 5 180
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 6 150.

Install VANOS adjustment unit . See **11 36 010 Removing And Installing Or Replacing Double VANOS Adjustment Unit (M52TU / M54 / M56)**.

Assemble engine.

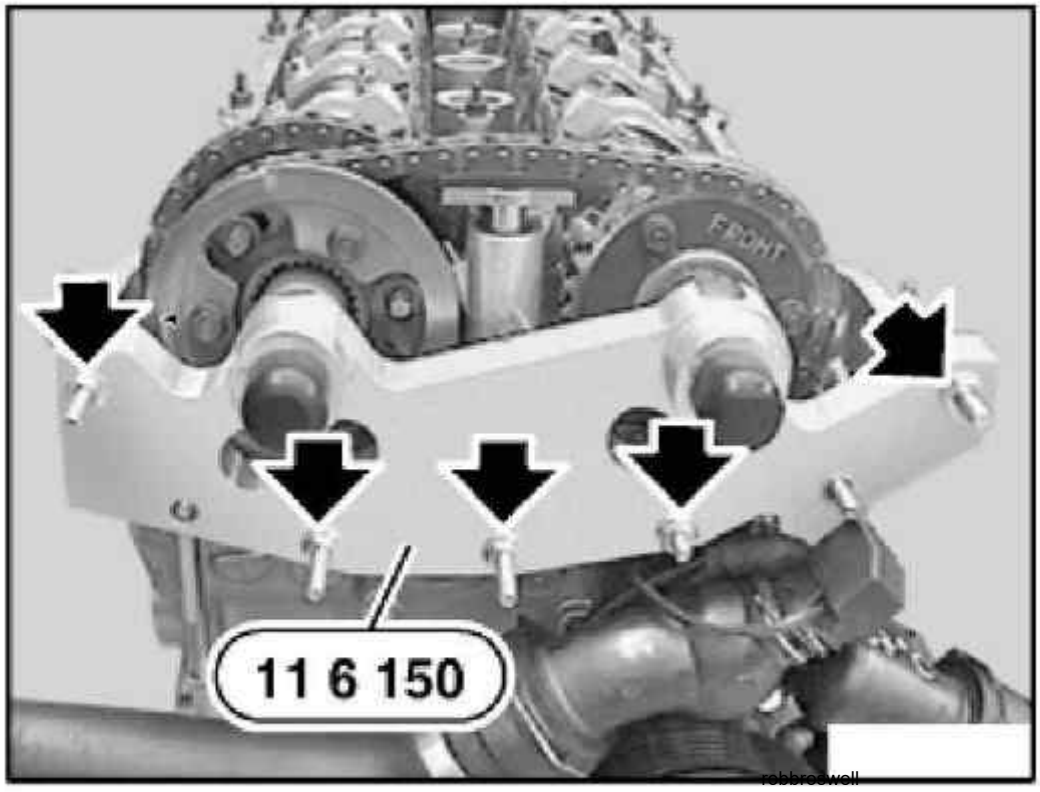


Fig. 285: Removing Special Tool 11 6 150
Courtesy of BMW OF NORTH AMERICA, INC.

VALVES WITH SPRINGS

11 34 552 REMOVING AND INSTALLING OR REPLACING ALL VALVES (M52 / S52 / M52TU / M54 / M56)

(cylinder head removed)

Preliminary tasks are described in Disassembling and assembling cylinder head .

Replace valve stem seals . See **11 34 560 Replacing All Valve Stem Seals (M52 / S52 / M52TU / M54 / M56)**.

Remove valves from cylinder head.

If necessary, check valve guide for wear .

If necessary, ream valve guide .

If necessary, remachine valve seat .

Arrangement:

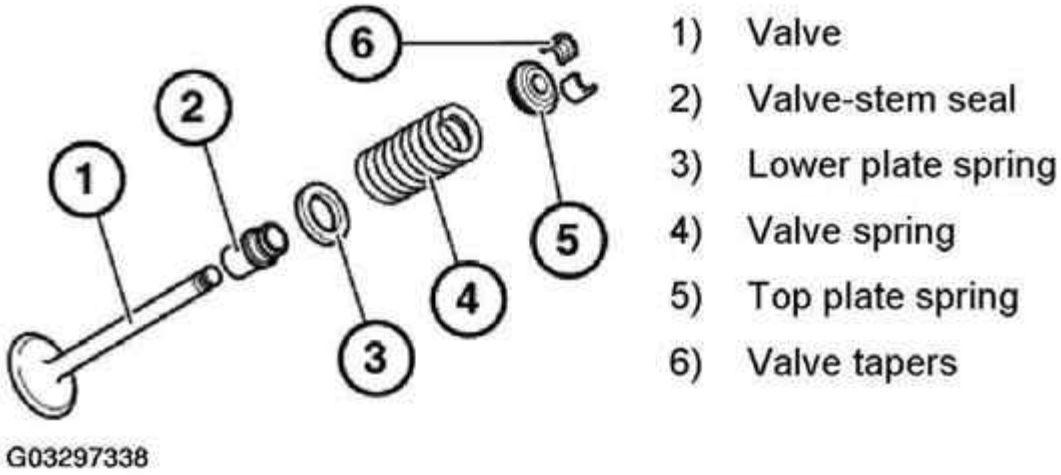


Fig. 286: Identifying Valve Components robbroswell
Courtesy of BMW OF NORTH AMERICA, INC.

1. Valve
2. Valve-stem seal
3. Lower plate spring
4. Valve spring
5. Top plate spring
6. Valve tapers

11 34 560 REPLACING ALL VALVE STEM SEALS (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 11 1 200
- 11 1 480
- 11 1 960

(cylinder head removed)

Preliminary tasks are described in Disassembling and assembling cylinder head .

Remove all valve springs . See **11 34 715 Replacing All Valve Springs (M52 / S52 / M52TU / M54 / M56)**.

Remove valve stem seal with special tool 11 1 480.

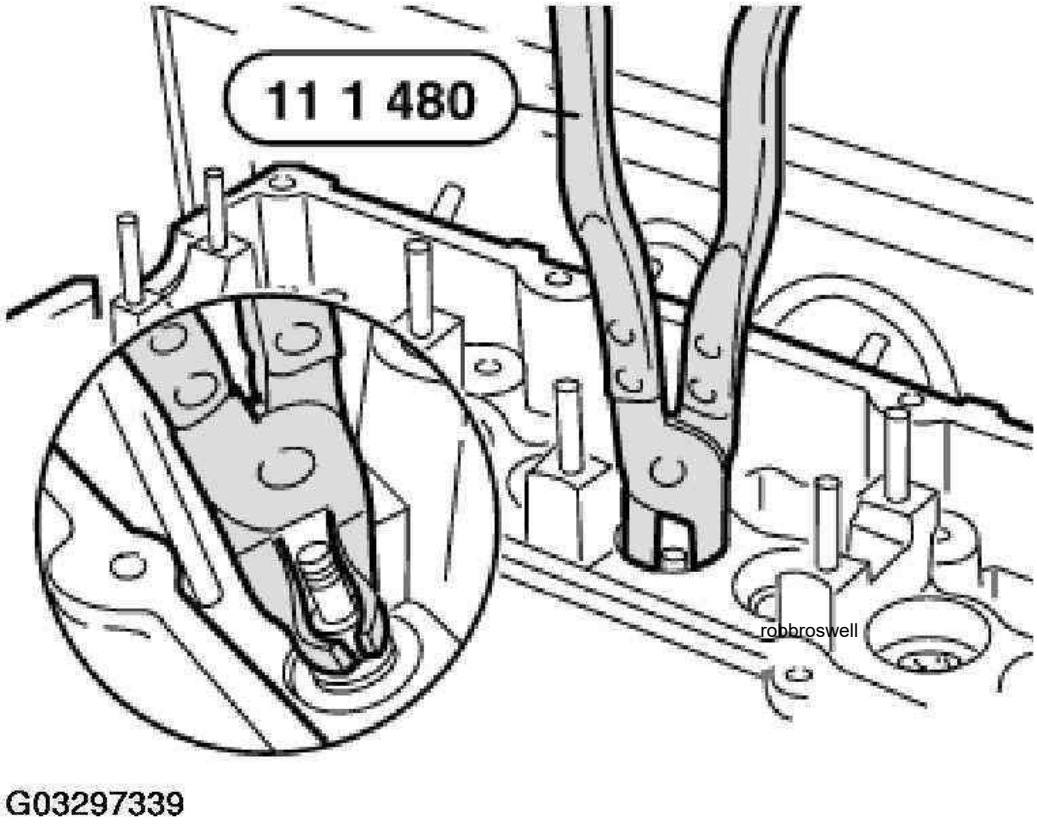


Fig. 287: Removing Valve Stem Seal With Special Tool 11 1 480
Courtesy of BMW OF NORTH AMERICA, INC.

Lubricate valve stem with oil and insert valve. Fit special tool 11 1 960.

Coat new valve stem seal (1) with oil and install.

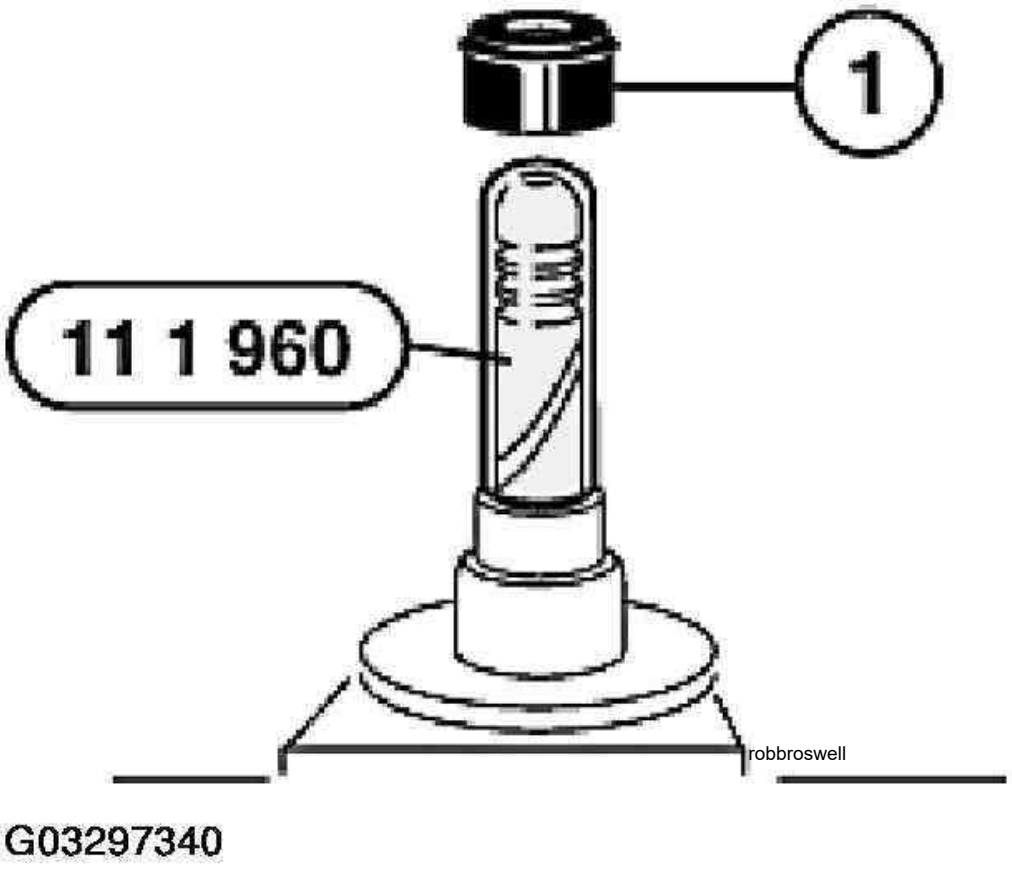


Fig. 288: Coating New Valve Stem Seal
Courtesy of BMW OF NORTH AMERICA, INC.

Press valve stem seal firmly home by hand with special tool 11 1 200.

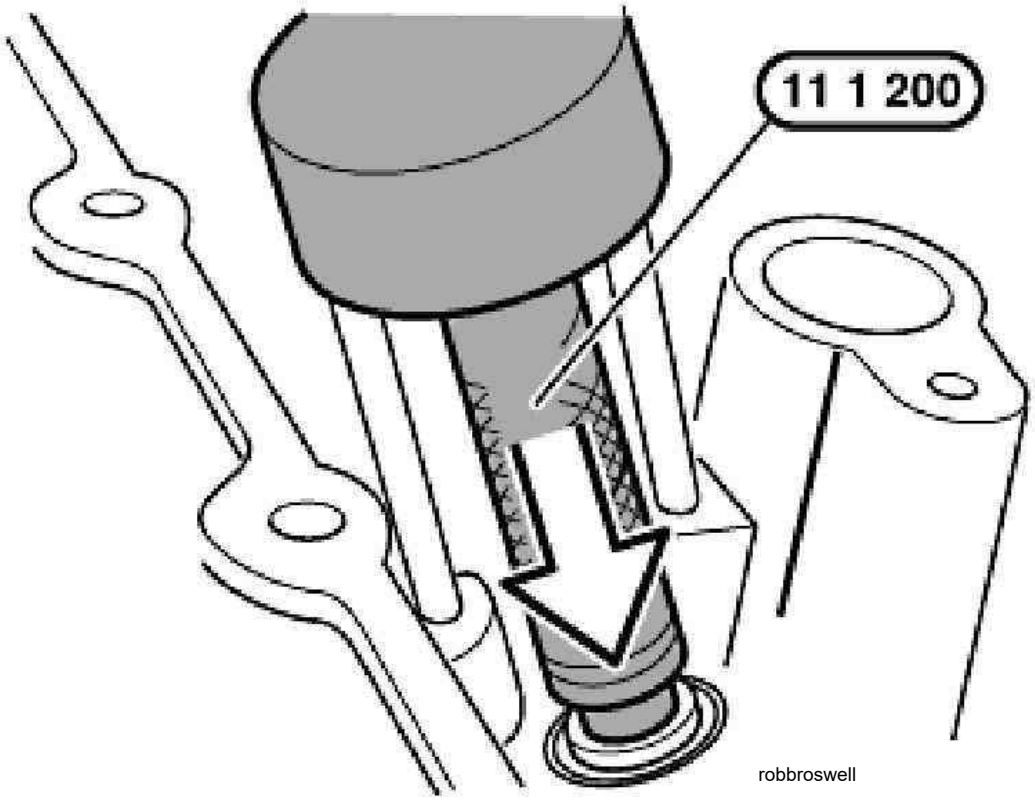


Fig. 289: Pressing Valve Stem Seal With Special Tool 11 1 200
Courtesy of BMW OF NORTH AMERICA, INC.

11 34 715 REPLACING ALL VALVE SPRINGS (M52 / S52 / M52TU / M54 / M56)

Special tools required:

- 11 0 342
- 11 0 345
- 11 1 045
- 11 1 065
- 11 1 441
- 11 3 030
- 11 3 250

(cylinder head removed)

Preliminary tasks are described in Disassembling and assembling cylinder head .

Brace bucket tappets with special tool 11 3 250.

Lift out bearing strip with bucket tappet.

Installation:

Only re-use used bucket tappets in the same tappet bore.

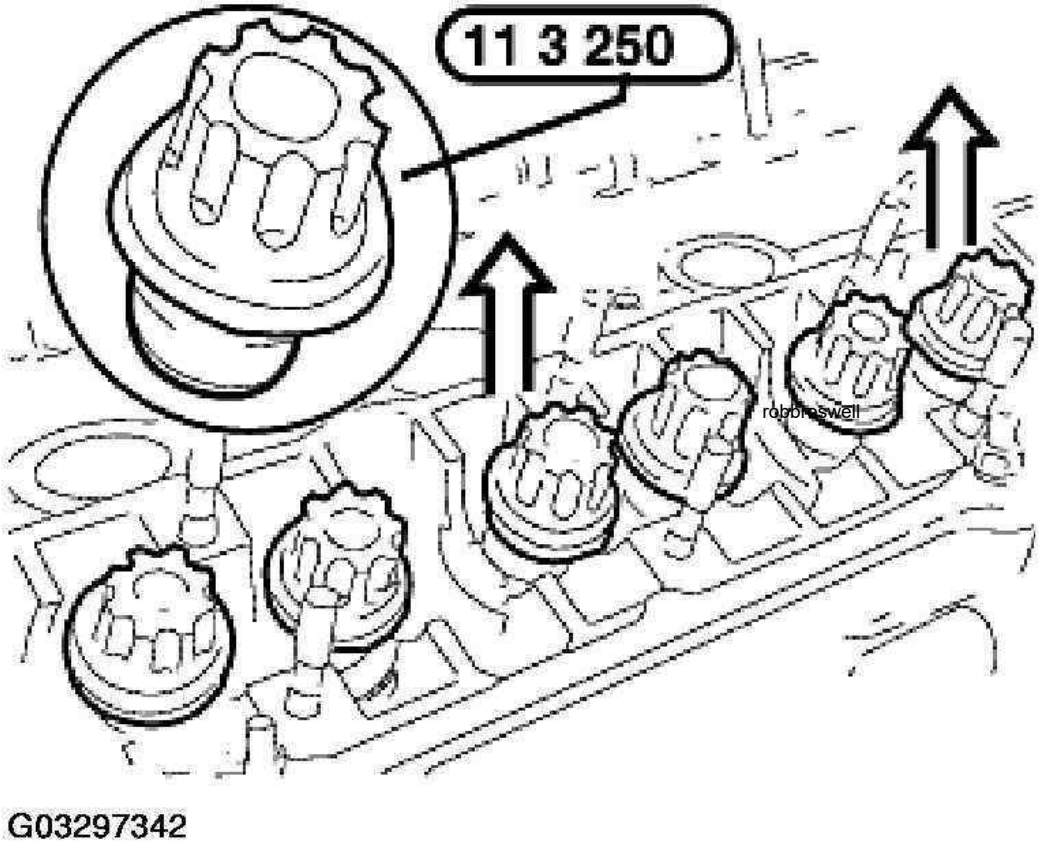
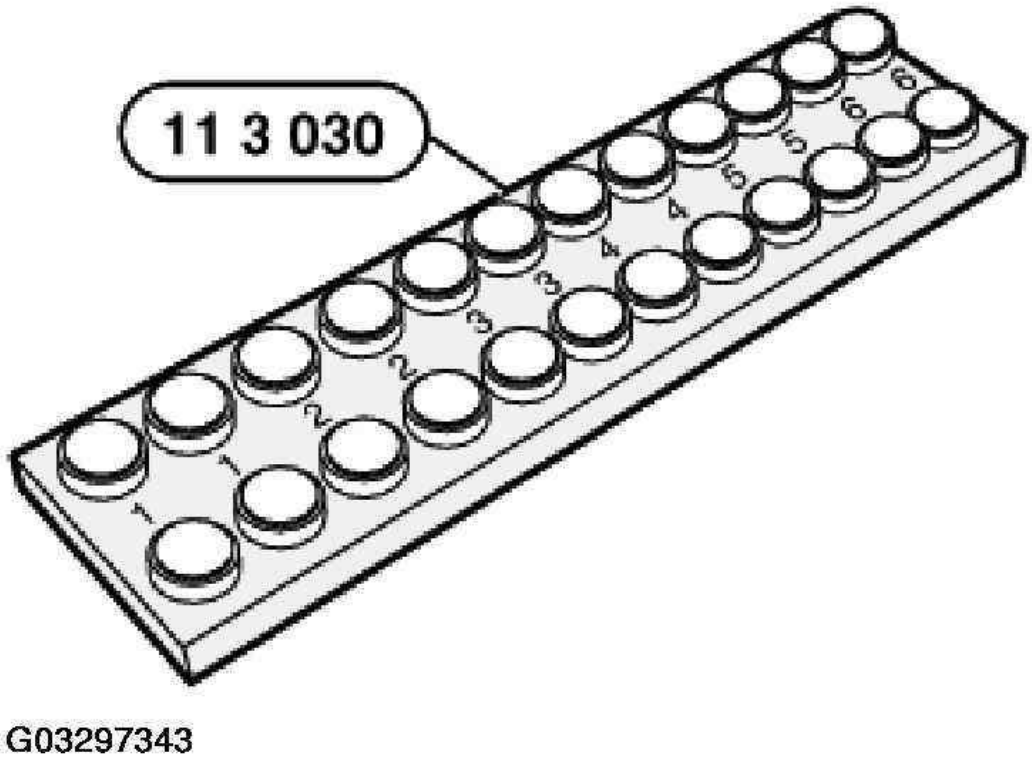


Fig. 290: Lifting Out Bearing Strip With Bucket Tappet
Courtesy of BMW OF NORTH AMERICA, INC.

Arrange bucket tappets by cylinder and place on special tool 11 3 030 in correct order.



robbroswell

Fig. 291: Arranging Bucket Tappets By Cylinder And Placing On Special Tool 11 3 030 In Correct Order
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 1 441 from below in special tool 11 1 065 and secure with special tool 11 1 045.

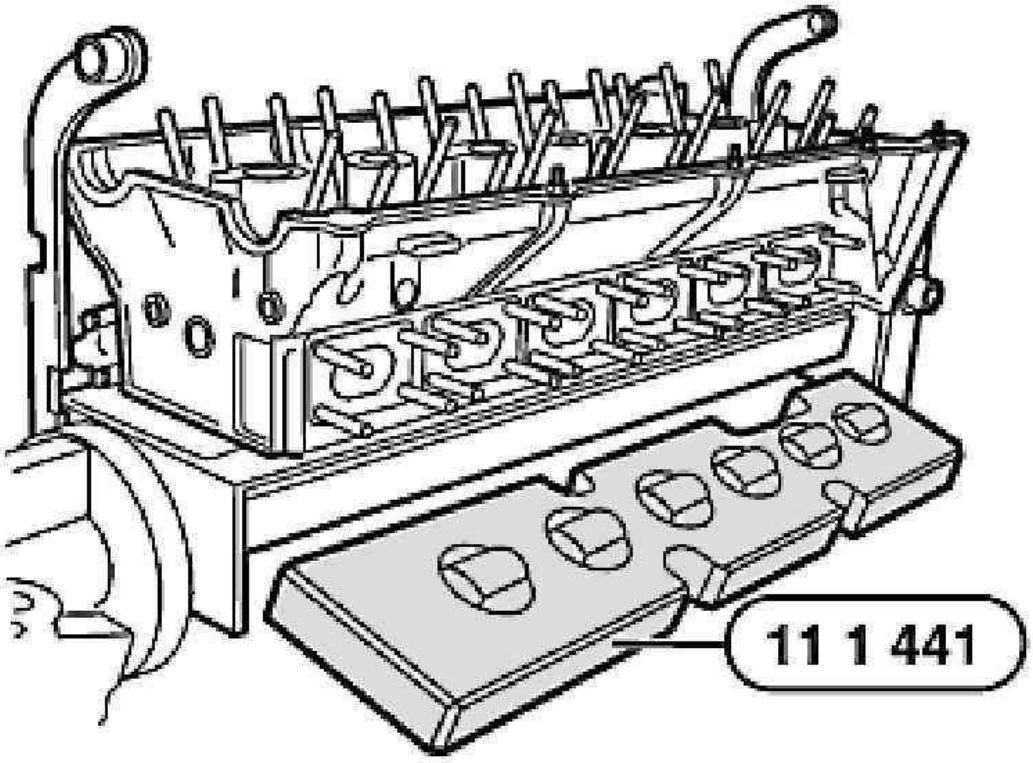


Fig. 292: Inserting Special Tool 11 1 441 From Below In Special Tool 11 1 065 And Secure With Special Tool 11 1 045
Courtesy of BMW OF NORTH AMERICA, INC.

Align special tool 11 0 345 in direction of valve shaft and select appropriate groove in special tool 11 0 342.

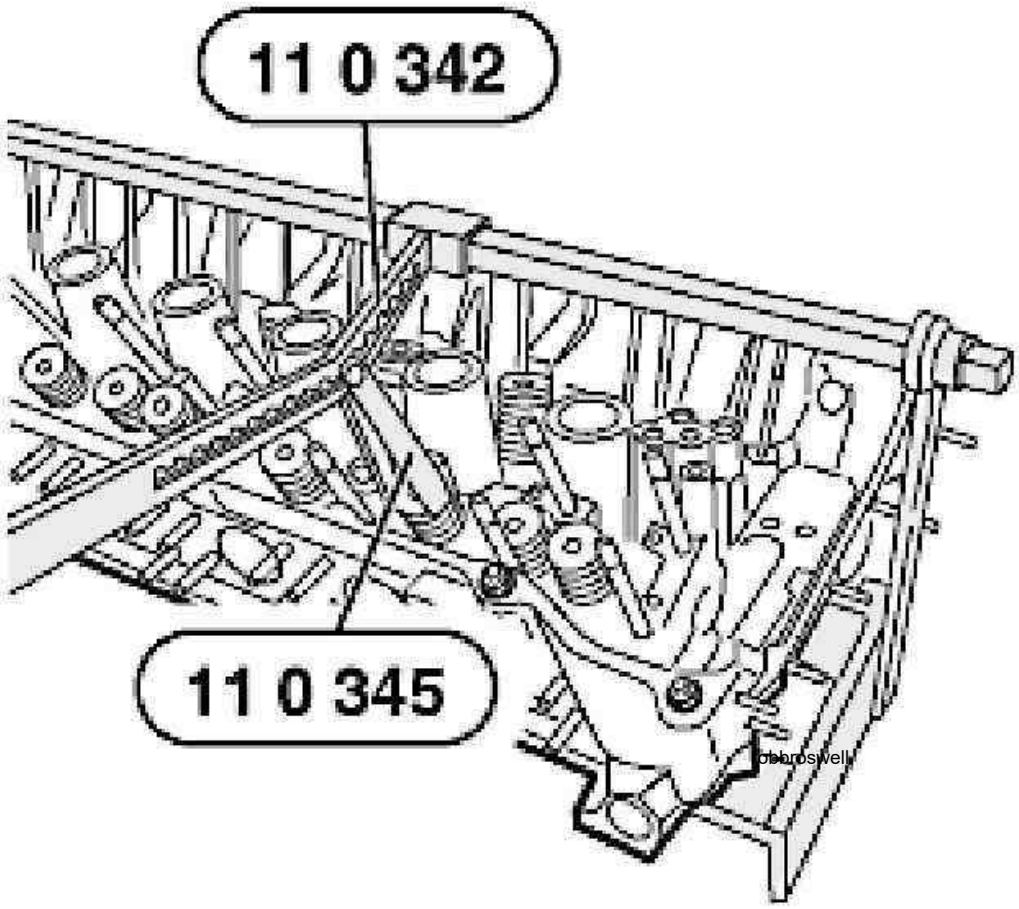


Fig. 293: Aligning Special Tool 11 0 345 In Direction Of Valve Shaft And Selecting Appropriate Groove In Special Tool 11 0 342
Courtesy of BMW OF NORTH AMERICA, INC.

Press down valve spring on spring cap, top, and remove valve keys.

Remove valve spring and plate spring.

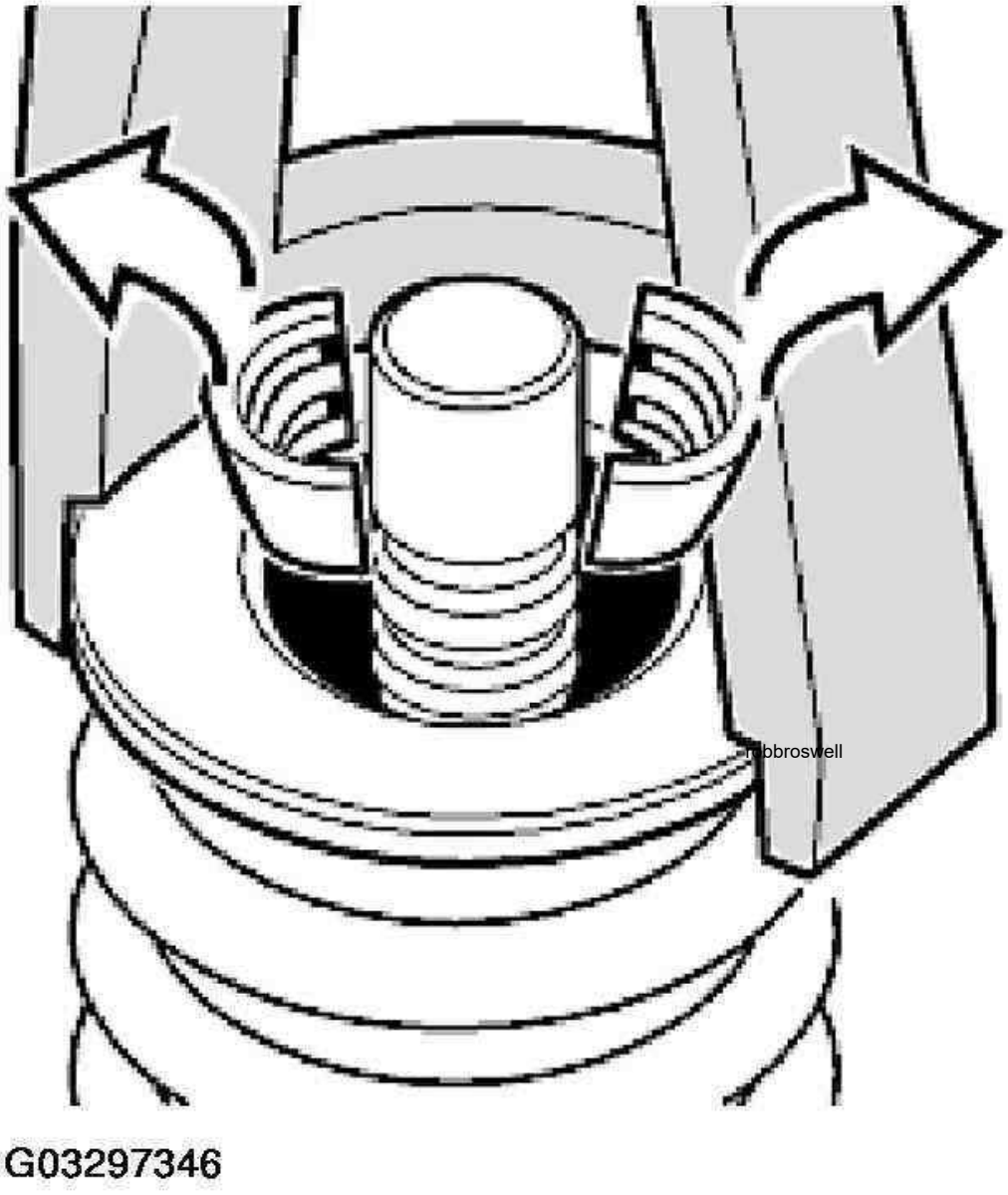


Fig. 294: Removing Valve Keys
Courtesy of BMW OF NORTH AMERICA, INC.

Arrangement:

1. Valve
2. Valve-stem seal

3. Lower plate spring
4. Valve spring
5. Top plate spring
6. Valve tapers

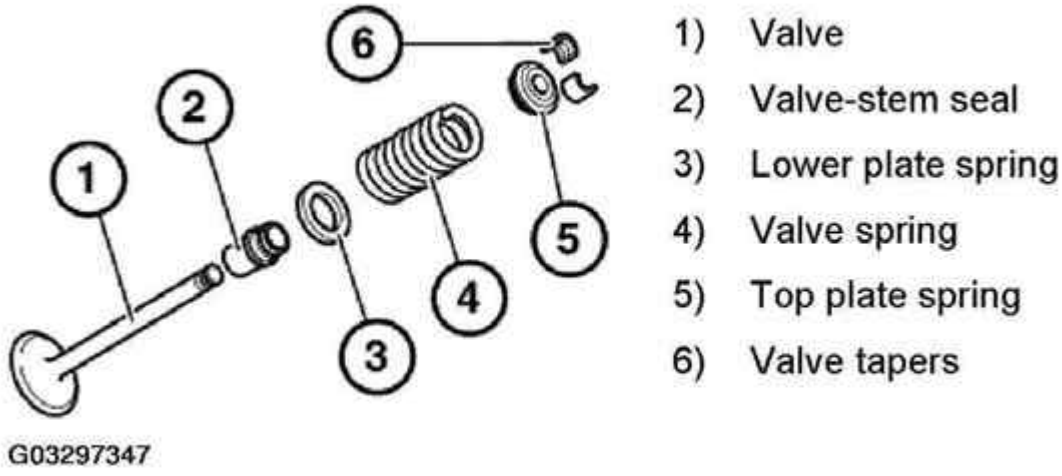


Fig. 295: Identifying Valve Components robbroswell
Courtesy of BMW OF NORTH AMERICA, INC.

VARIABLE CAMSHAFT TIMING

11 36 010 REMOVING AND INSTALLING OR REPLACING DOUBLE VANOS ADJUSTMENT UNIT (M52TU / M54 / M56)

Special tools required:

- 00 9 250
- 11 2 300
- 11 3 240
- 11 3 450
- 11 4 220
- 11 6 170

Necessary preliminary tasks:

- Remove intake filter housing with air-mass flow sensor
- Remove cylinder head cover . See **11 12 000 Removing And Installing, Sealing Cylinder Head Cover (M52TU / M54 / M56)**

- Remove spark plugs . See **12 12 011 REPLACING ALL SPARK PLUGS** .

E85 only:

- Remove radiator cover . See **RADIATOR COVER** .
- Drain coolant from radiator. See **17 00 005 DRAINING OFF AND TOPPING UP COOLANT** .

NOTE: Protect drive belt against emerging coolant.

- Remove right coolant hose
- Remove solenoid valve for exhaust side

Removal:

Removal of double VANOS adjustment unit is described separately from installation. Assembly sequence for removal and installation is different.

Detach plastic cover for inlet camshaft.

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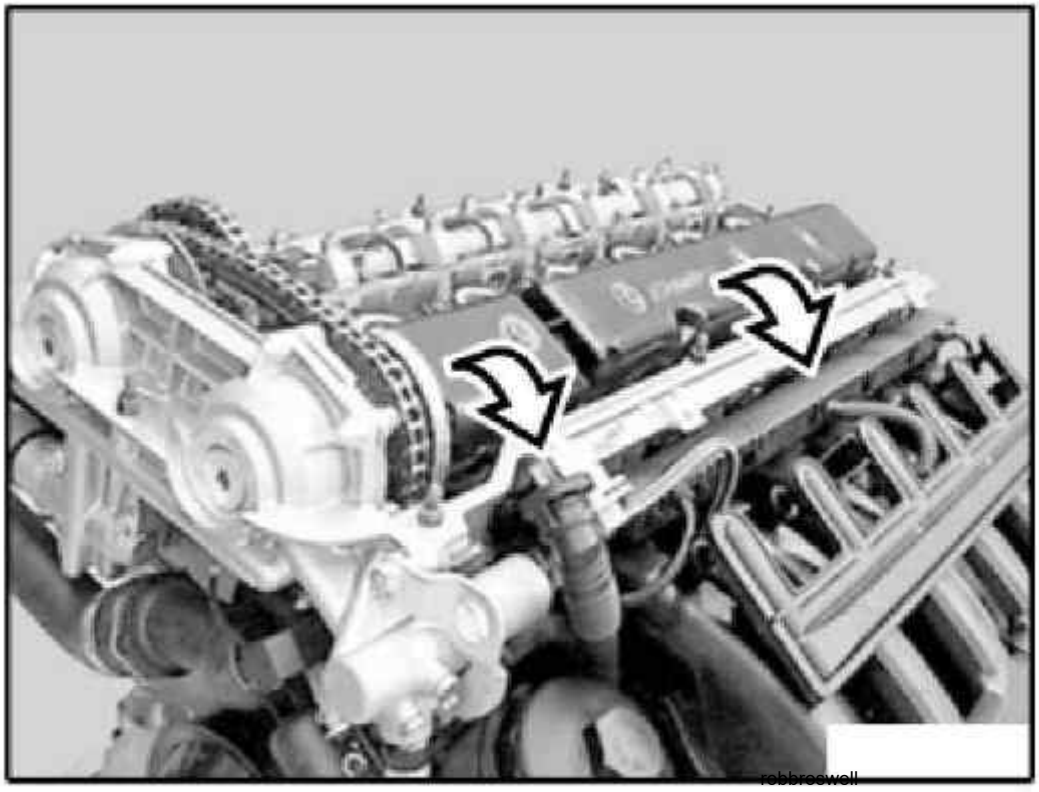


Fig. 296: Detaching Plastic Cover For Inlet Camshaft
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew oil pressure pipe.

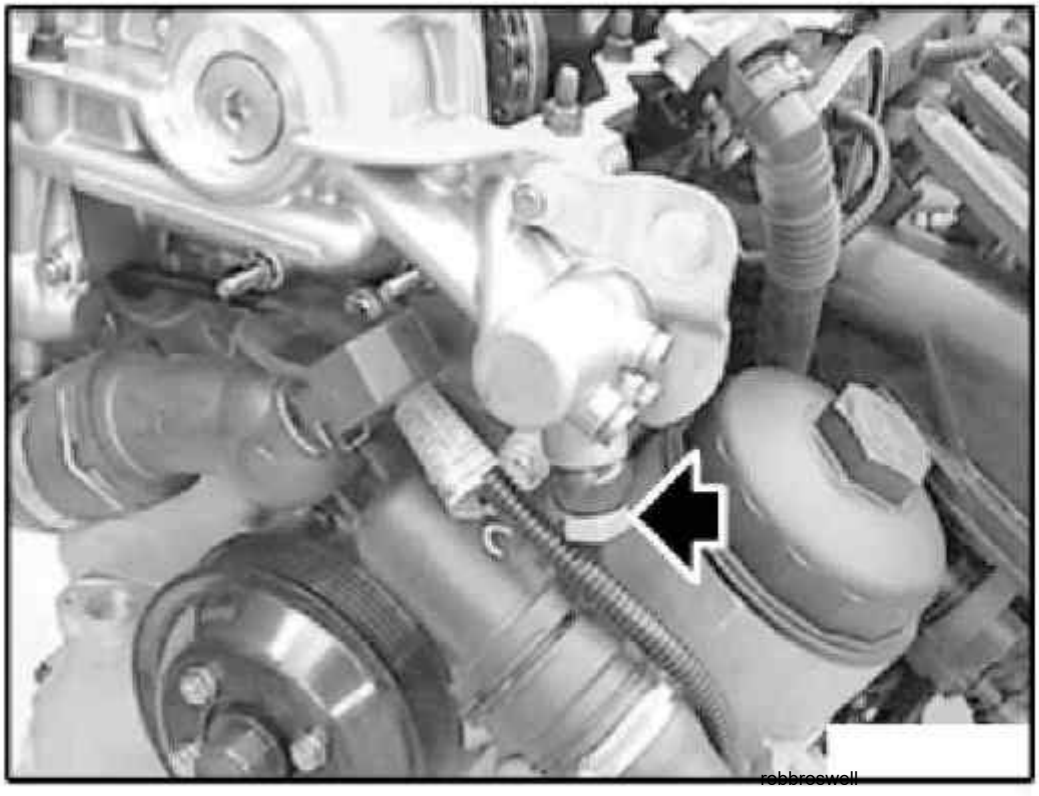
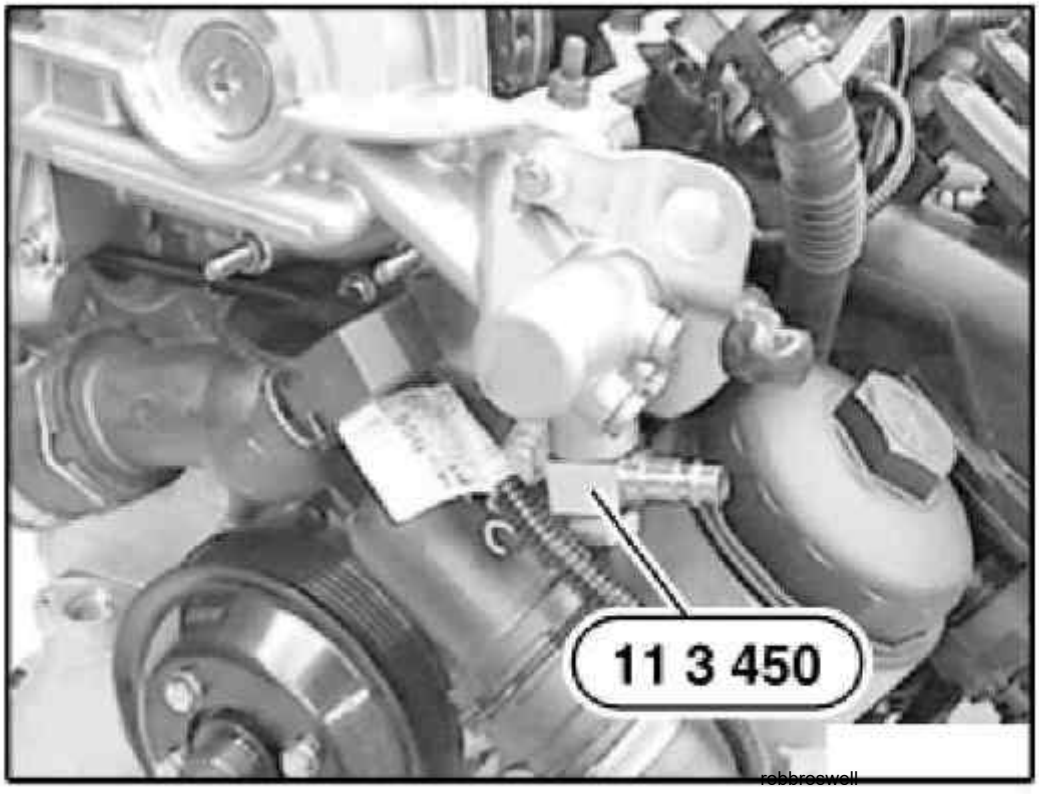


Fig. 297: Unscrewing Oil Pressure Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Mount special tool 11 3 450 with banjo bolt of oil pressure line.



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Fig. 298: Mounting Special Tool 11 3 450 With Banjo Bolt Of Oil Pressure Line
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cover double VANOS adjustment unit.

When the compressed air supply is connected, several drops of oil are sprayed out of the bore.

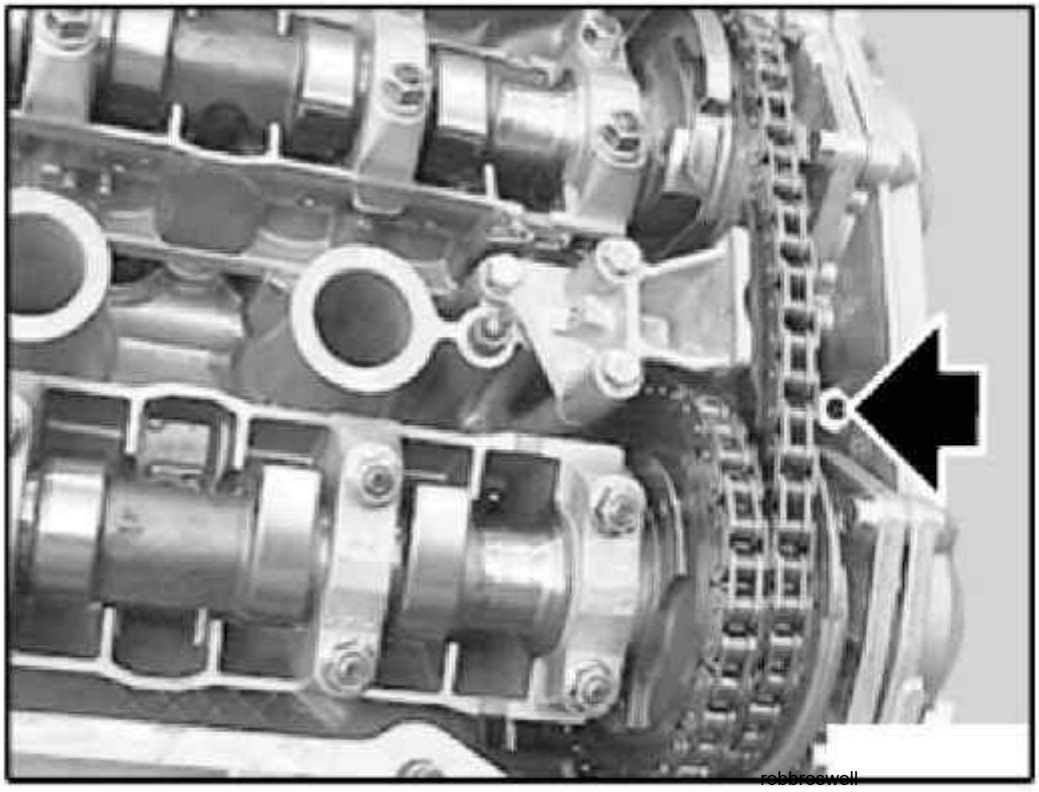
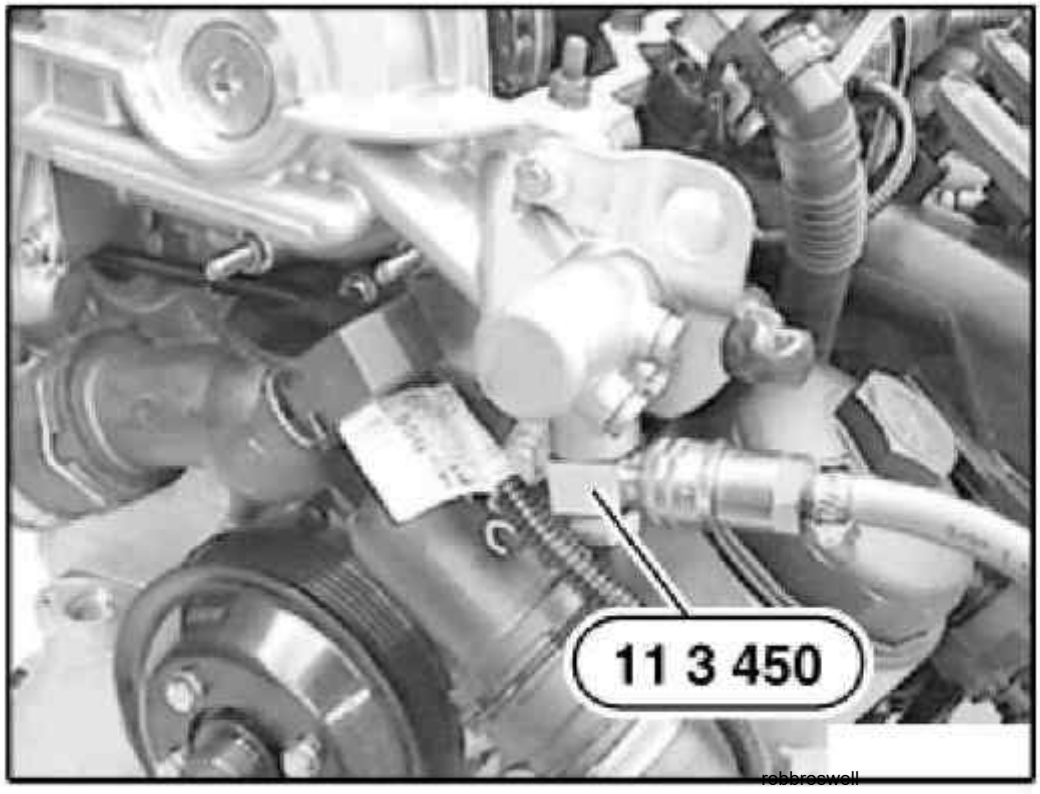


Fig. 299: Identifying Bore For Sprayed Oil Drops
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air (2 to 8 bar).



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Fig. 300: Connecting Compressed Air (2-8 Bar)
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: **When the engine is switched off, it is possible that the camshafts are not in their initial positions. With the compressed air supply connected, rotate the engine to return the camshafts to their initial positions.**
With compressed air supply connected, crank engine at least two revolutions in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face each other.

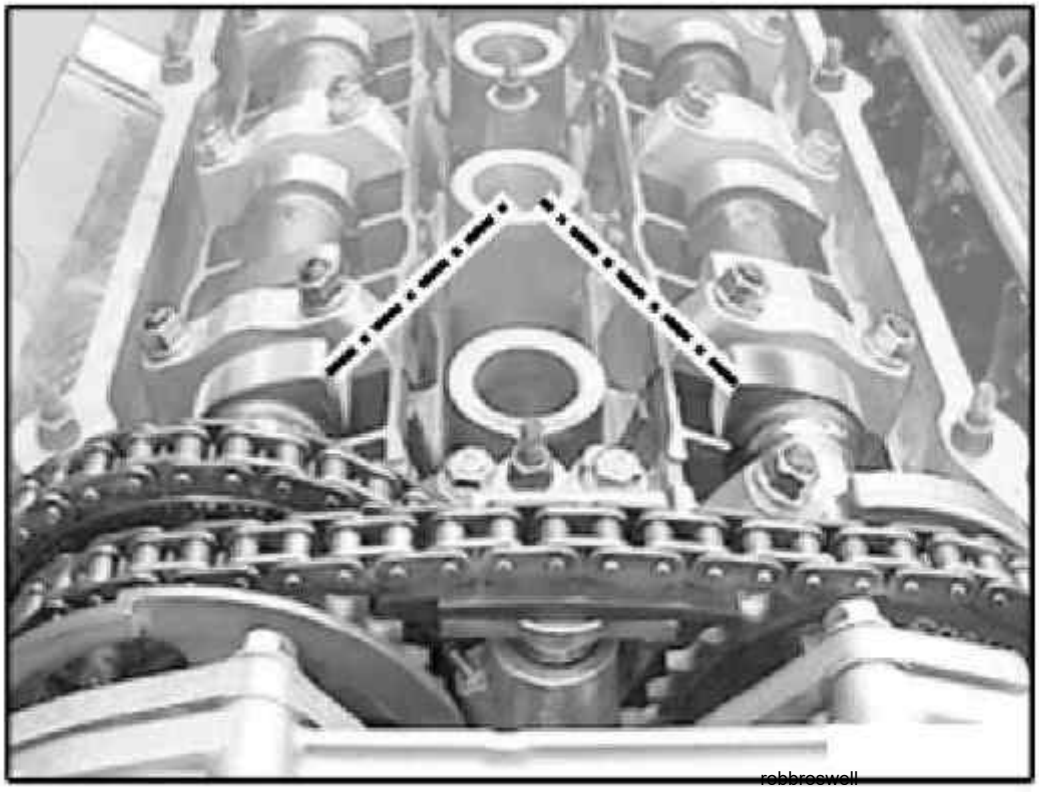


Fig. 301: Identifying Position Of Cam Tips On Inlet And Exhaust Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

Pull dust guard out of the special tool bore.

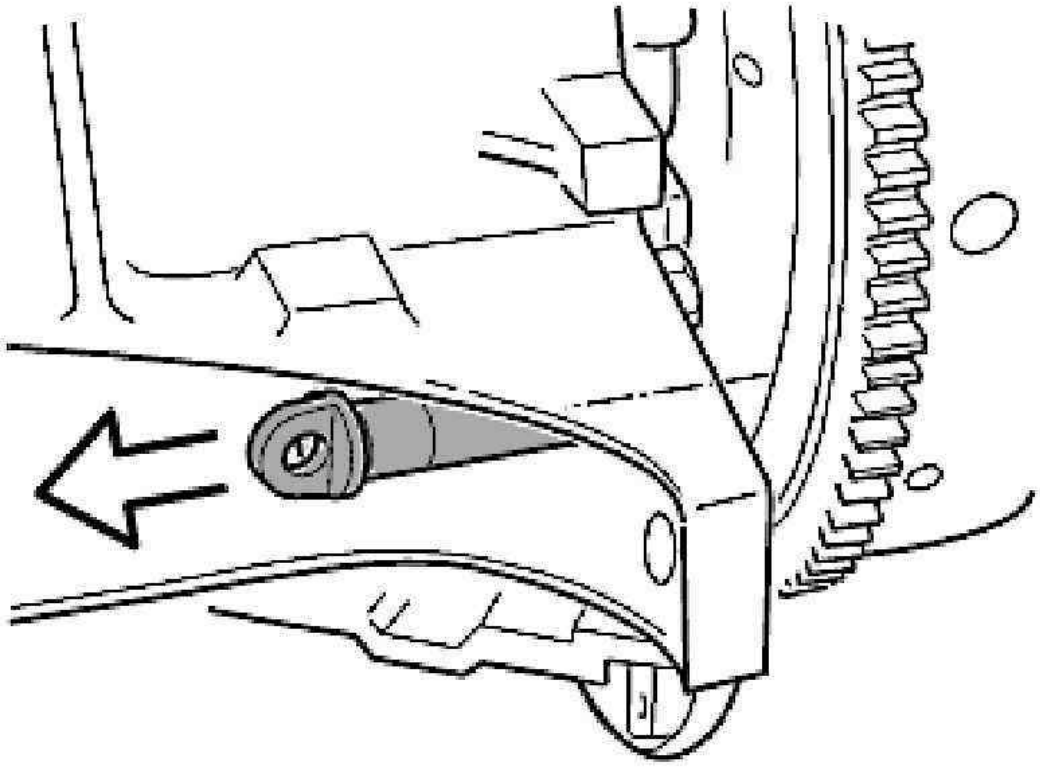


Fig. 302: Pulling Dust Guard Out Of Special Tool Bore
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft in firing TDC position with special tool 11 2 300.

IMPORTANT: Remove special tool 11 2 300 before switching on the engine.

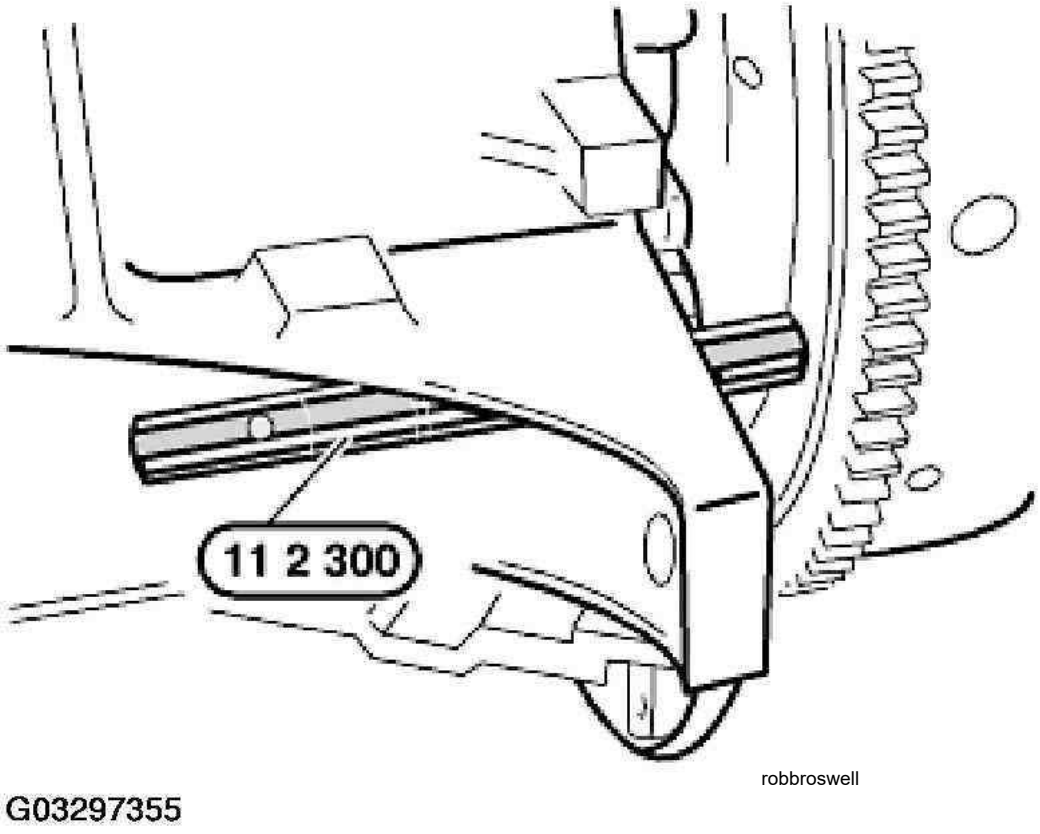


Fig. 303: Securing Crankshaft In Firing TDC Position With Special Tool 11 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

Automatic transmissions only:

Illustration does not show automatic transmission.

IMPORTANT: On engines with automatic transmissions, there is shortly before the special tool bore (1) a large bore (2) which can be confused with the special tool bore.

If special tool 11 2 300 is secured in the correct bore (1), the engine can no longer be cranked at the central bolt.

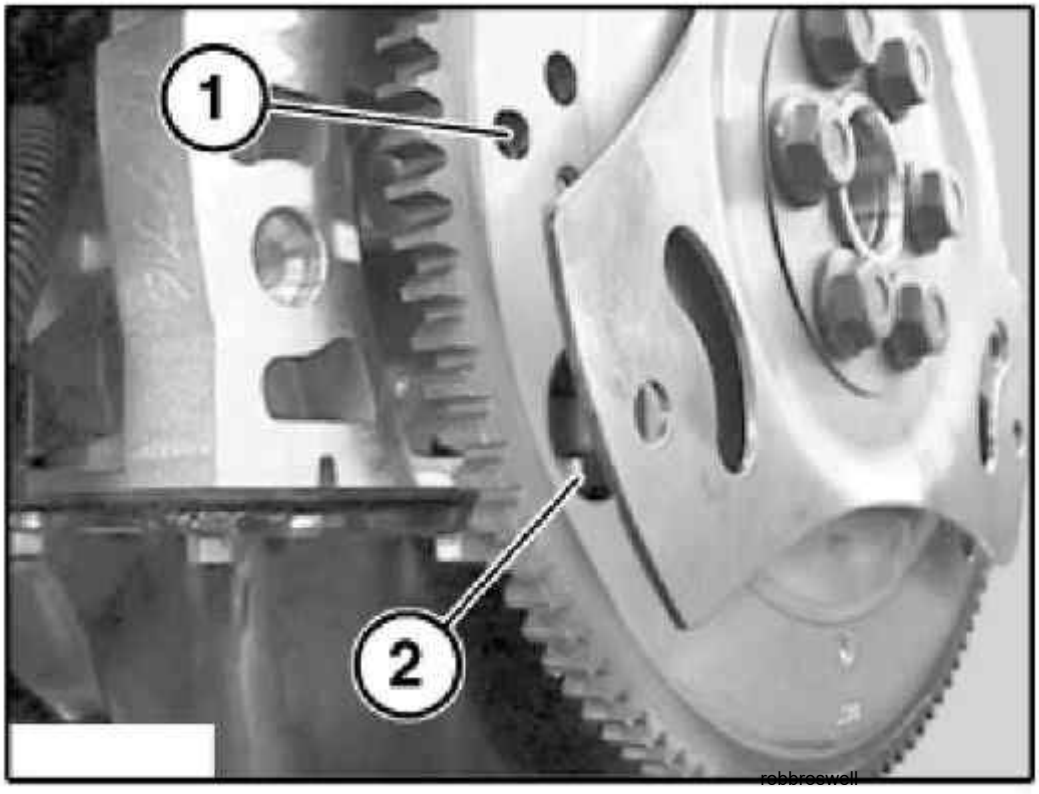


Fig. 304: Identifying Large Bore On Engines With Automatic Transmissions
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew studs.

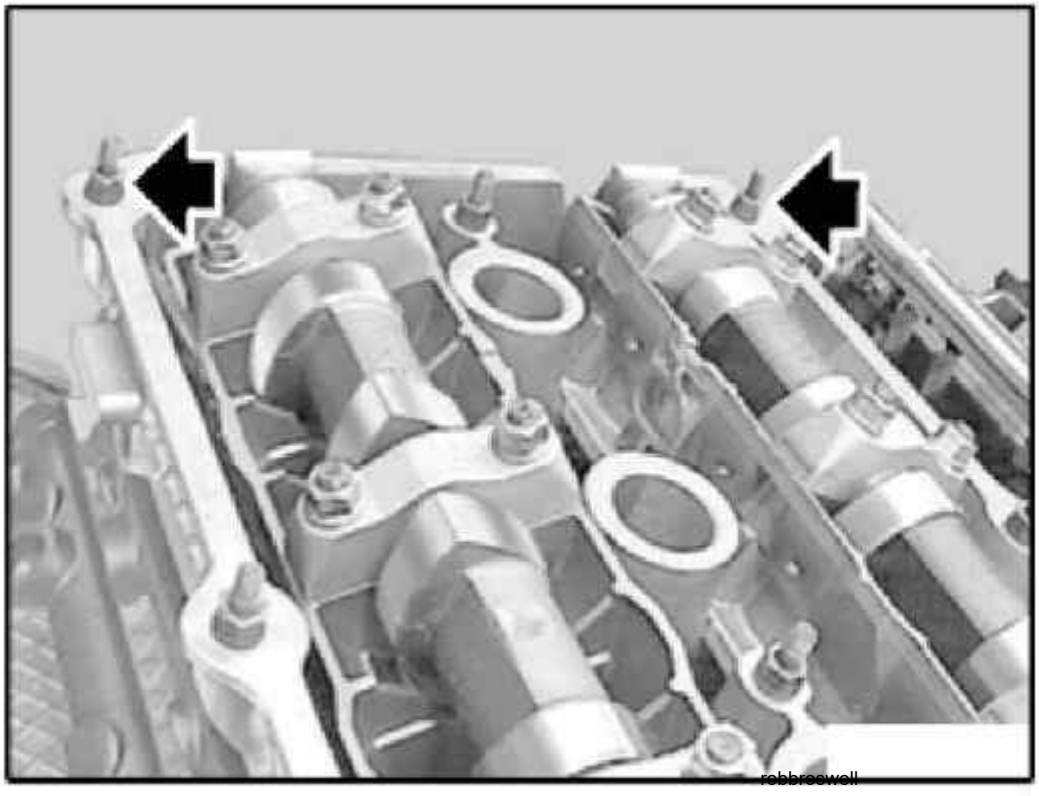


Fig. 305: Unscrewing Studs
Courtesy of BMW OF NORTH AMERICA, INC.

Secure camshafts with special tool 11 3 240.

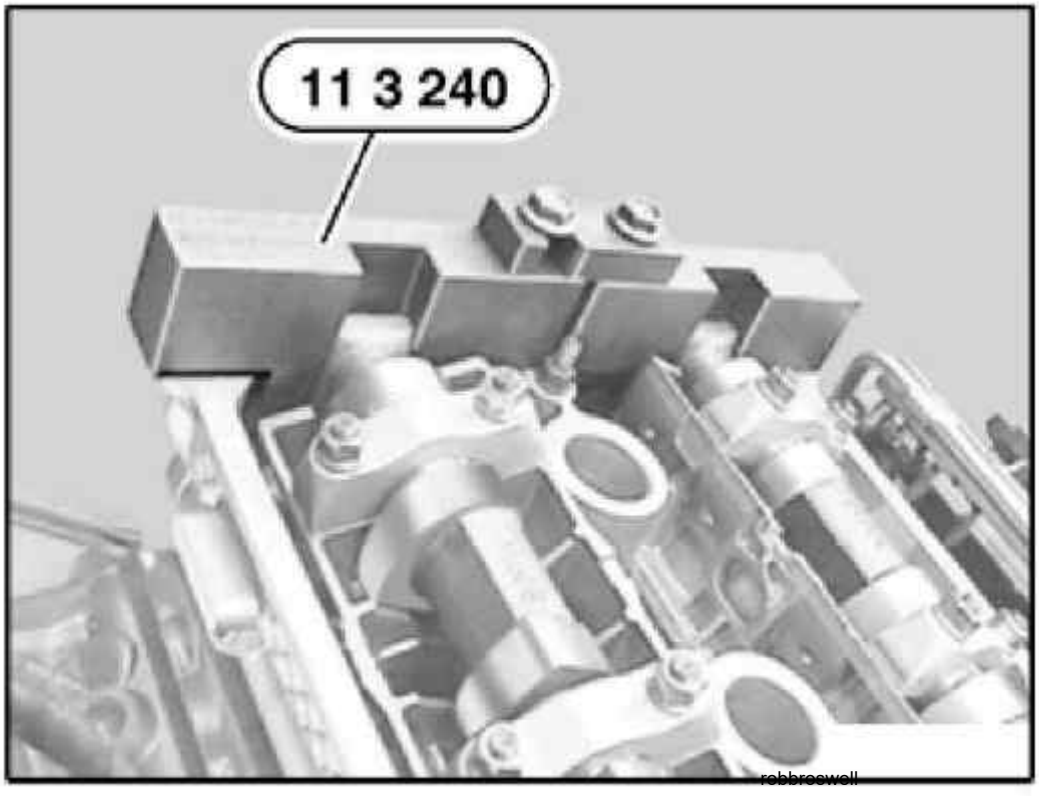
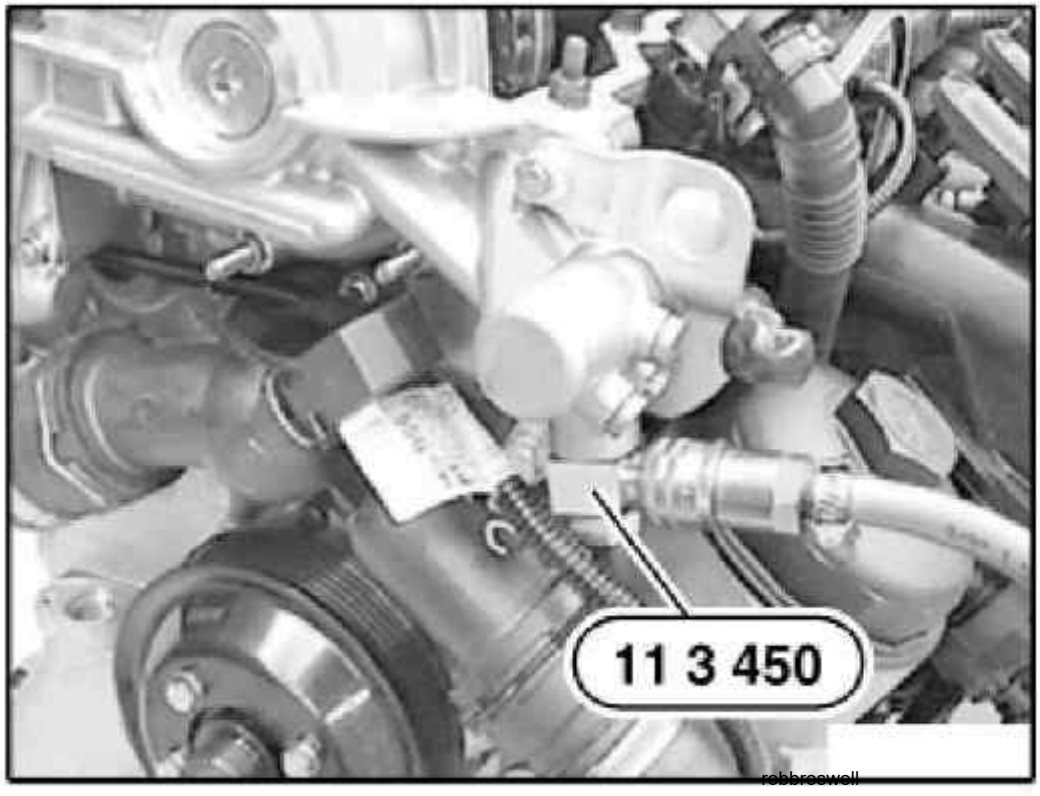


Fig. 306: Securing Camshafts With Special Tool 11 3 240
Courtesy of BMW OF NORTH AMERICA, INC.

Detach compressed air connection.

NOTE: special tool 11 3 450 still remains fitted.



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Fig. 307: Detaching Compressed Air Connection
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Oil escapes after screw plugs have been removed. Have cleaning cloths and container ready.

Make sure no oil runs onto belt drive. Remove any remnants of oil immediately with cleaning cloth.

Remove screw plugs, catch escaping oil on inlet and exhaust sides.

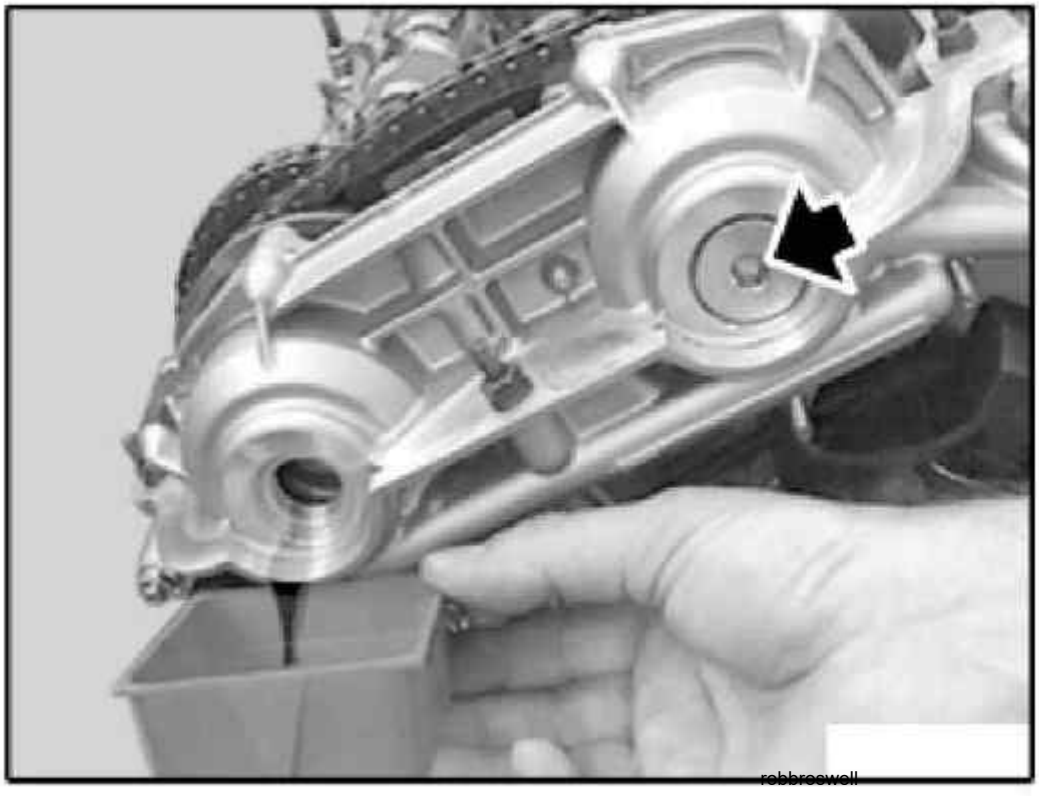
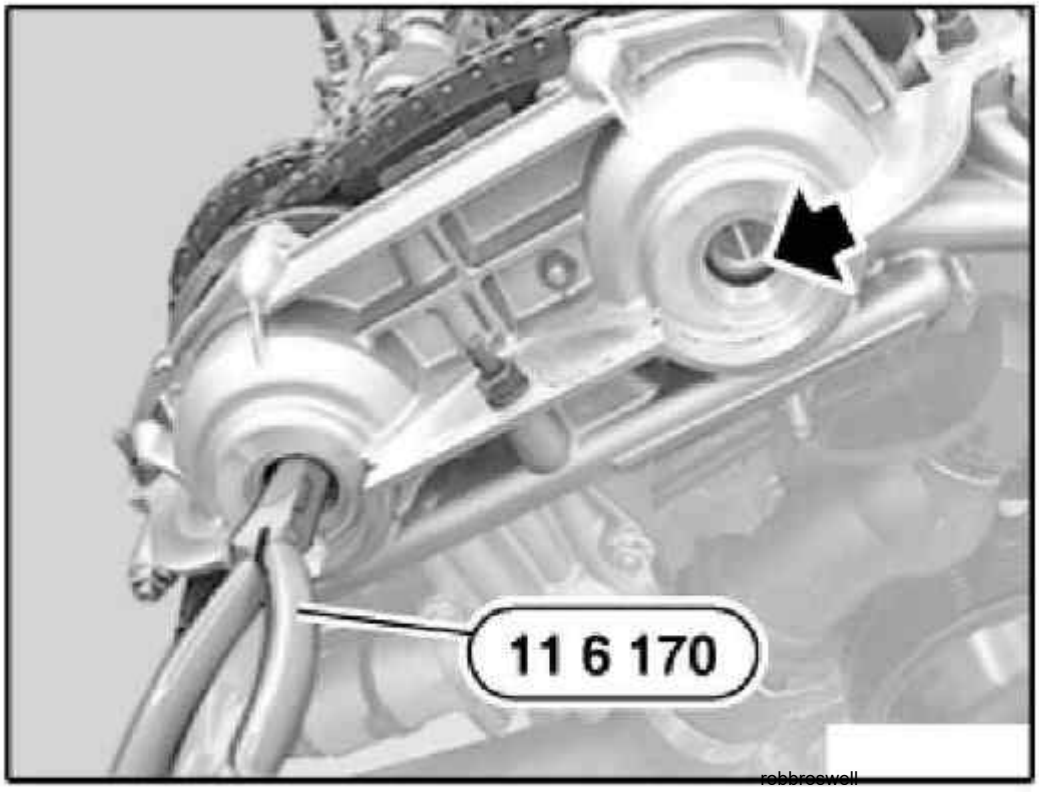


Fig. 308: Removing Screw Plugs & Catching Escaping Oil On Inlet And Exhaust Sides
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sealing caps with special tool 11 6 170 or with commercially available short flat nose pliers.

E85:

Use commercially available offset flat nose pliers.



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Fig. 309: Removing Sealing Caps With Special Tool 11 6 170
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Left-hand threads.

Release fitting screws on inlet and exhaust sides.

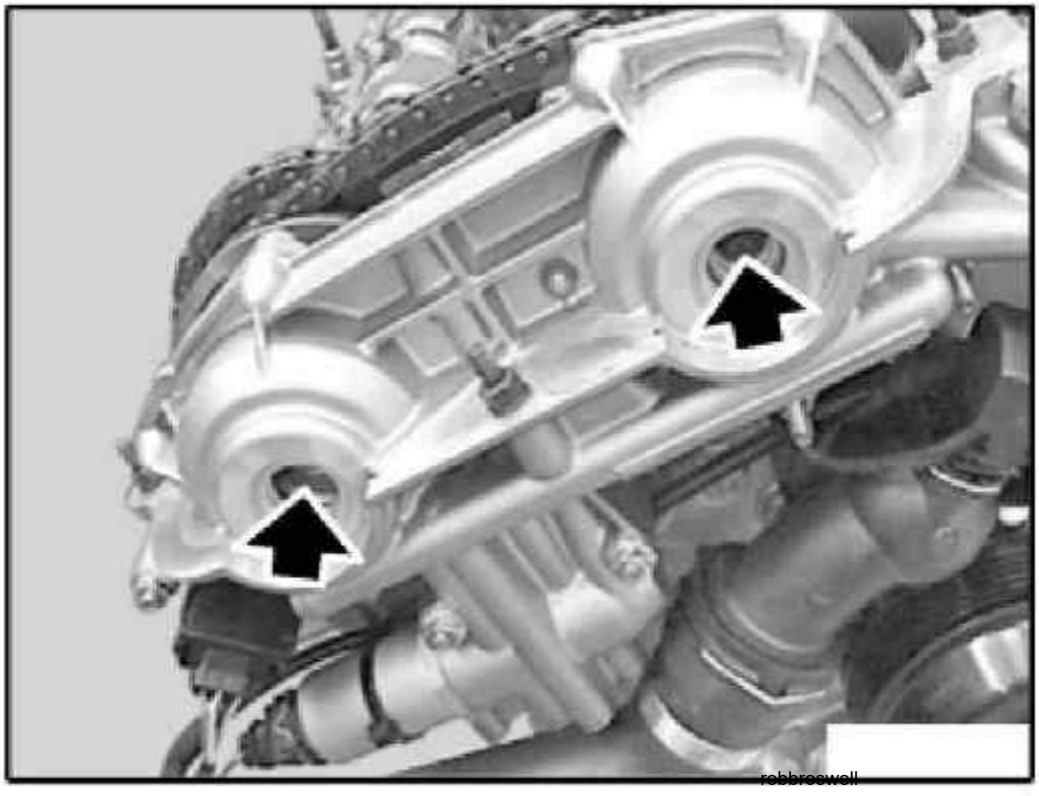


Fig. 310: Releasing Fitting Screws On Inlet And Exhaust Sides
Courtesy of BMW OF NORTH AMERICA, INC.

Detach plug connections from camshaft sensor and solenoid valves on exhaust and inlet sides.

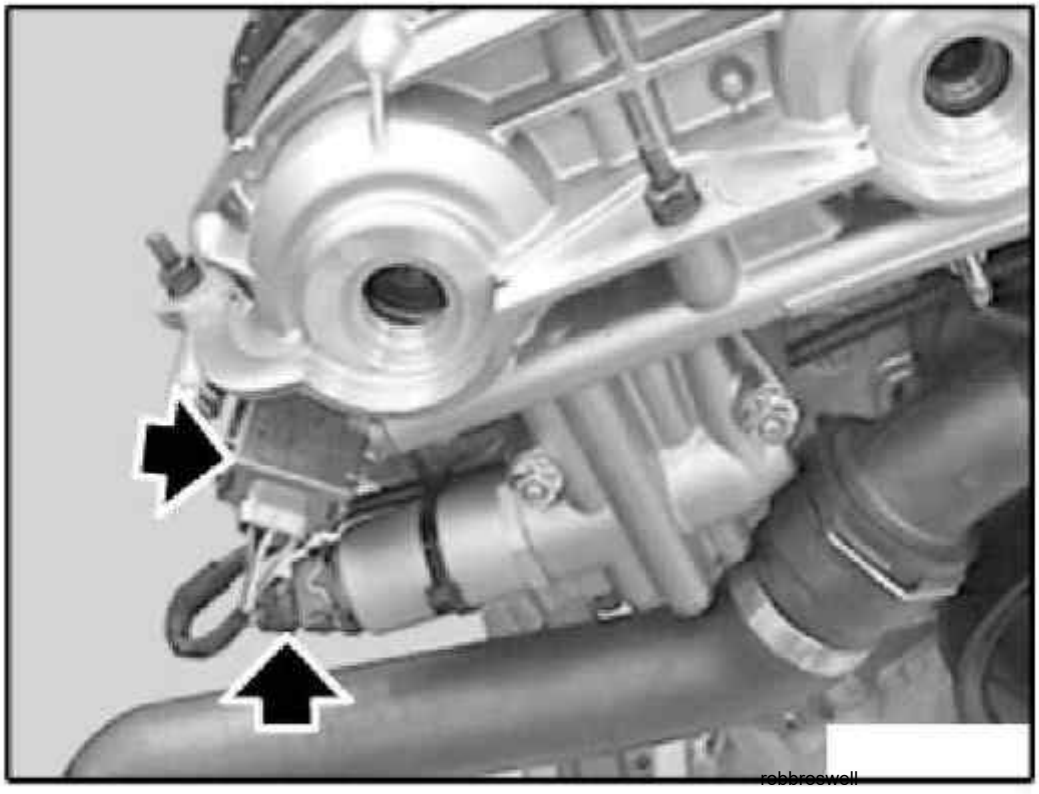


Fig. 311: Detaching Plug Connections From Camshaft Sensor And Solenoid Valves On Exhaust And Inlet Sides
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew suspension eye.

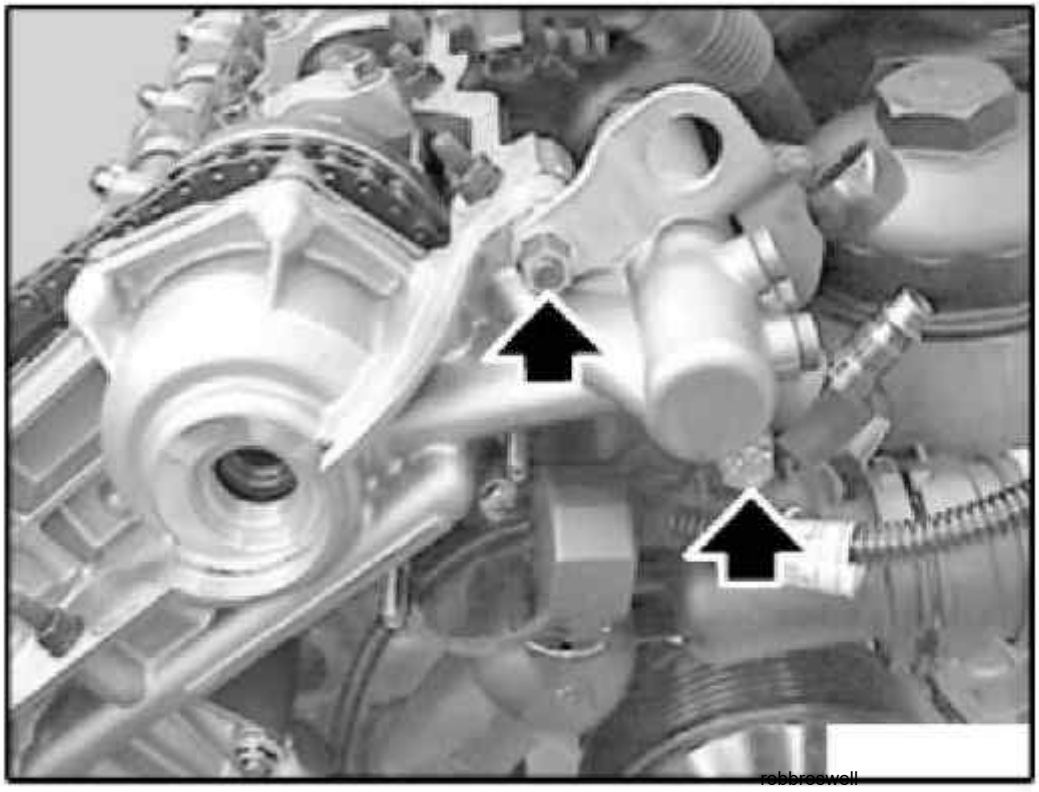


Fig. 312: Unscrewing Suspension Eye
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove double VANOS adjustment unit.

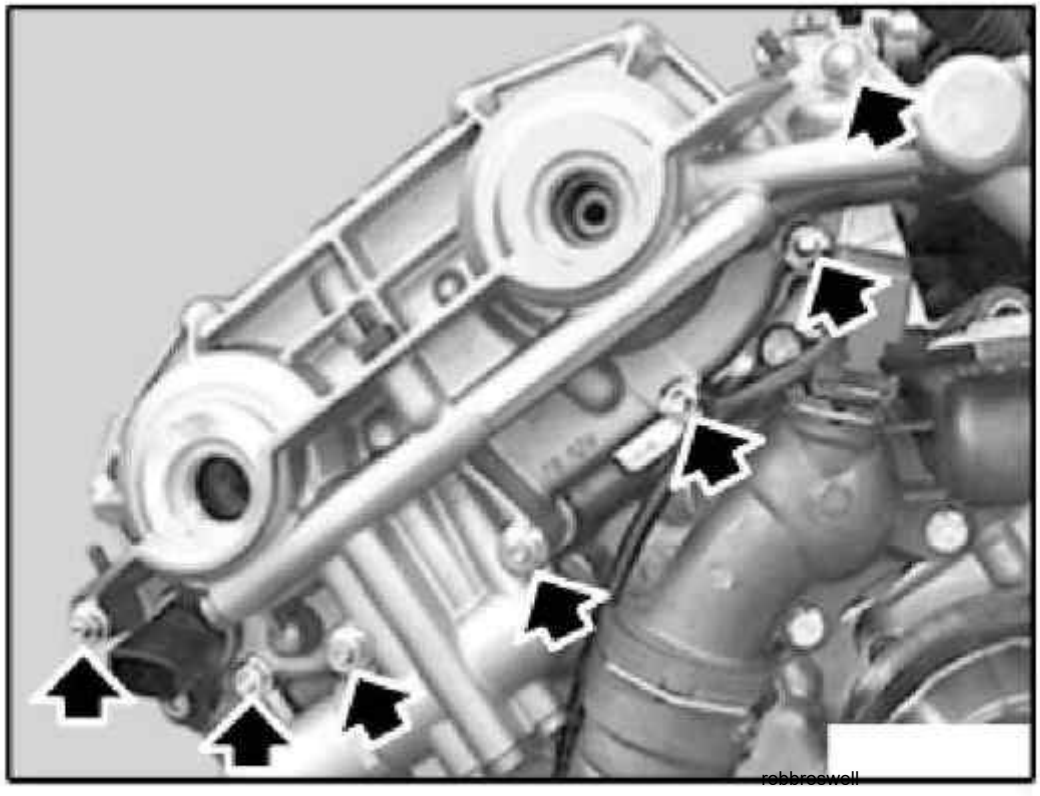


Fig. 313: Removing Double VANOS Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: With double VANOS adjustment unit removed:
Do not crank engine.
The toothed shaft on the inlet side may move and slip out of the spline teeth, the inlet camshaft is thus no longer non-positively connected and the valves could rest on the piston.

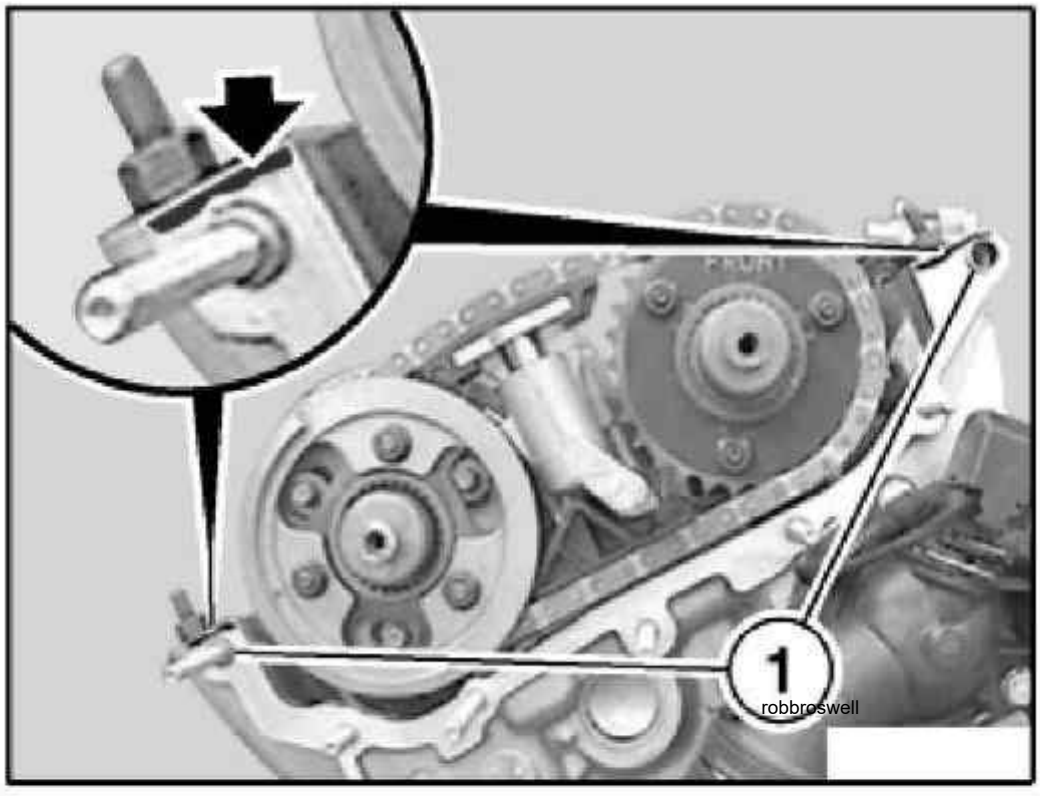
Installation:

Installation of double VANOS adjustment unit is described separately from removal. Assembly sequence for removal and installation is different.

Check dowel sleeves (1) for damage and correct installation position.

Keep sealing faces clean and free of oil. Apply a thin and even coat of sealing compound Drei Bond 1209 to contact surface edges of separating face between cylinder head and double VANOS adjustment unit.

Replace seal.



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Fig. 314: Checking Dowel Sleeves For Damage
Courtesy of BMW OF NORTH AMERICA, INC.

Install and secure double VANOS adjustment unit.

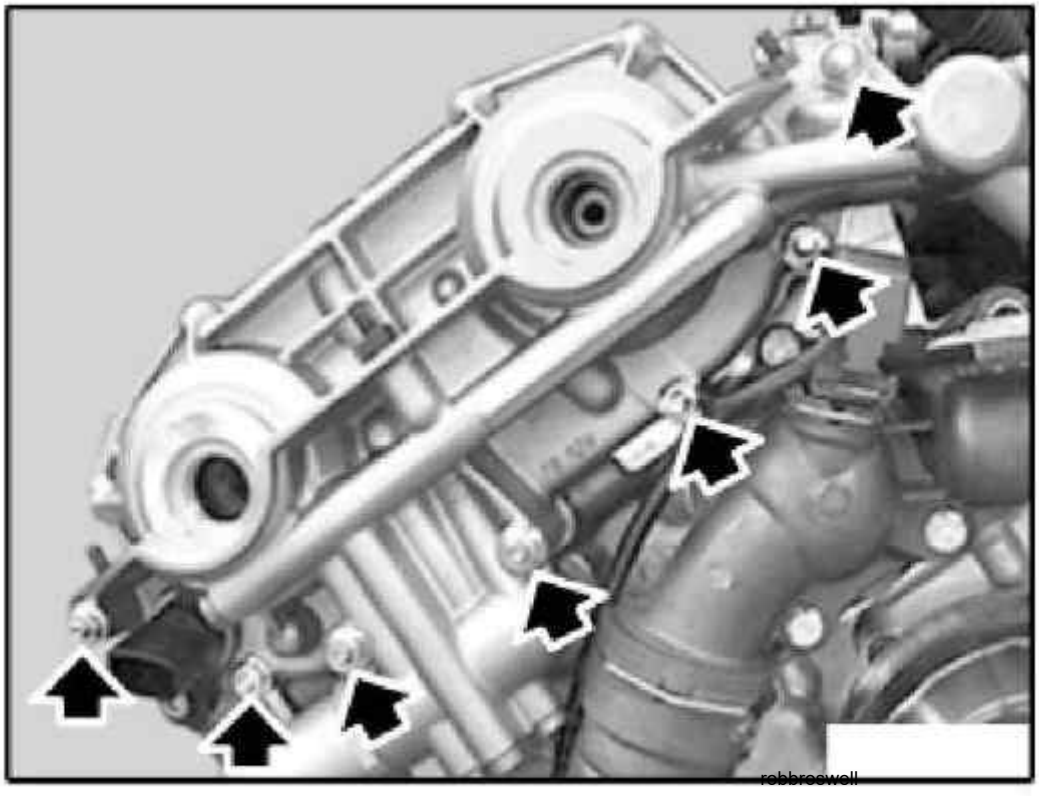


Fig. 315: Installing Double VANOS Adjustment Unit
Courtesy of BMW OF NORTH AMERICA, INC.

Attach plug connections of camshaft sensor and solenoid valves on exhaust and inlet sides.

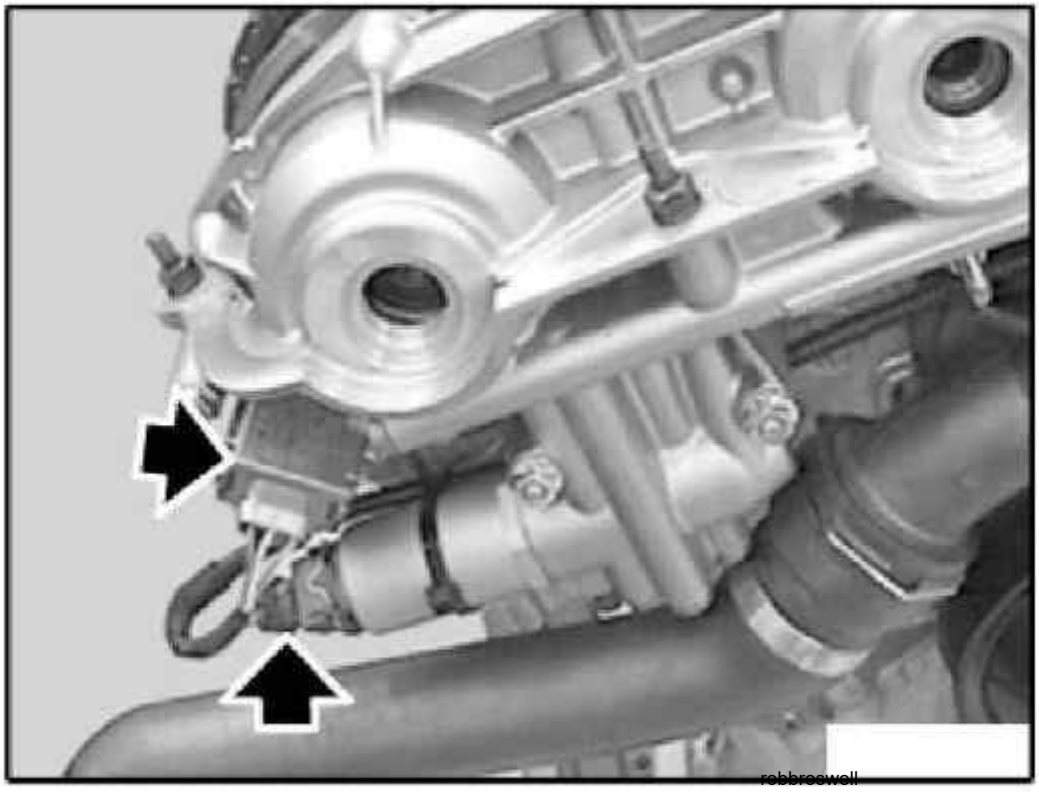


Fig. 316: Attaching Plug Connections Of Camshaft Sensor And Solenoid Valves On Exhaust And Inlet Sides
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Left-hand threads.

Insert fitting screws for hydraulic piston on toothed shaft on inlet and exhaust sides and tighten down.

Tightening torque, see 11 36 4AZ in **ENGINE - TIGHTENING TORQUES** .

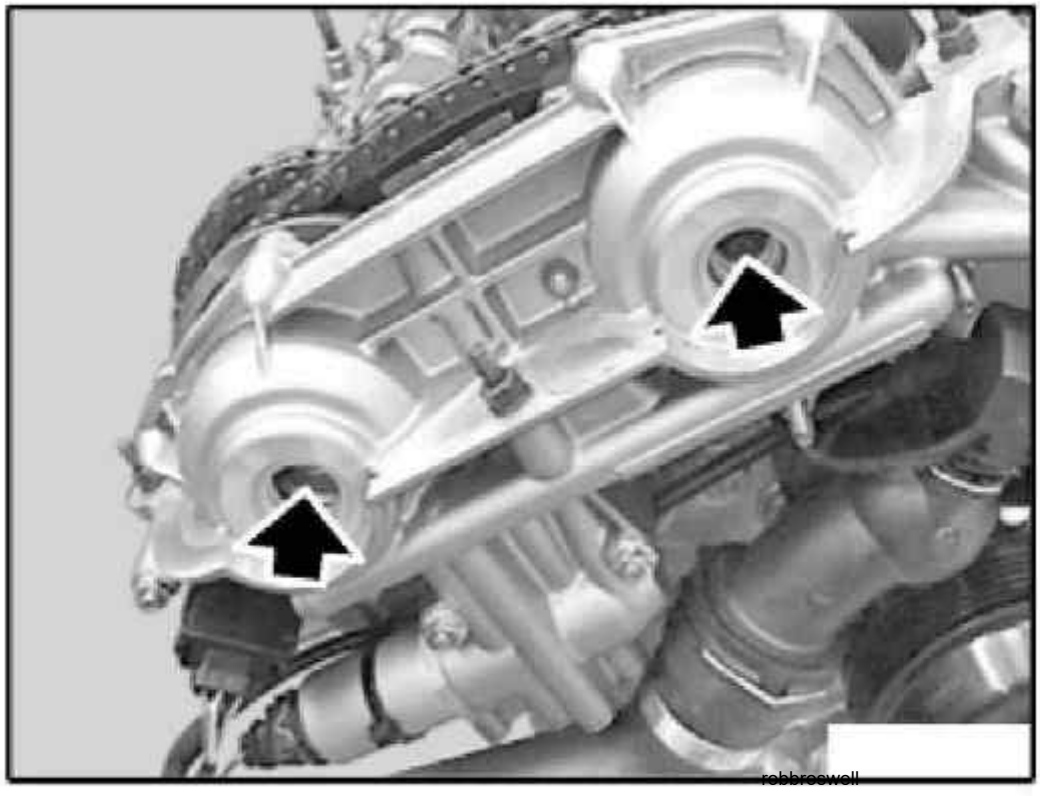


Fig. 317: Tightening Fitting Screws For Hydraulic Piston On Toothed Shaft On Inlet And Exhaust Sides
Courtesy of BMW OF NORTH AMERICA, INC.

Replace sealing caps and install with special tool 11 6 170 or with commercially available short flat nose pliers.

E85:

Use commercially available offset flat nose pliers.

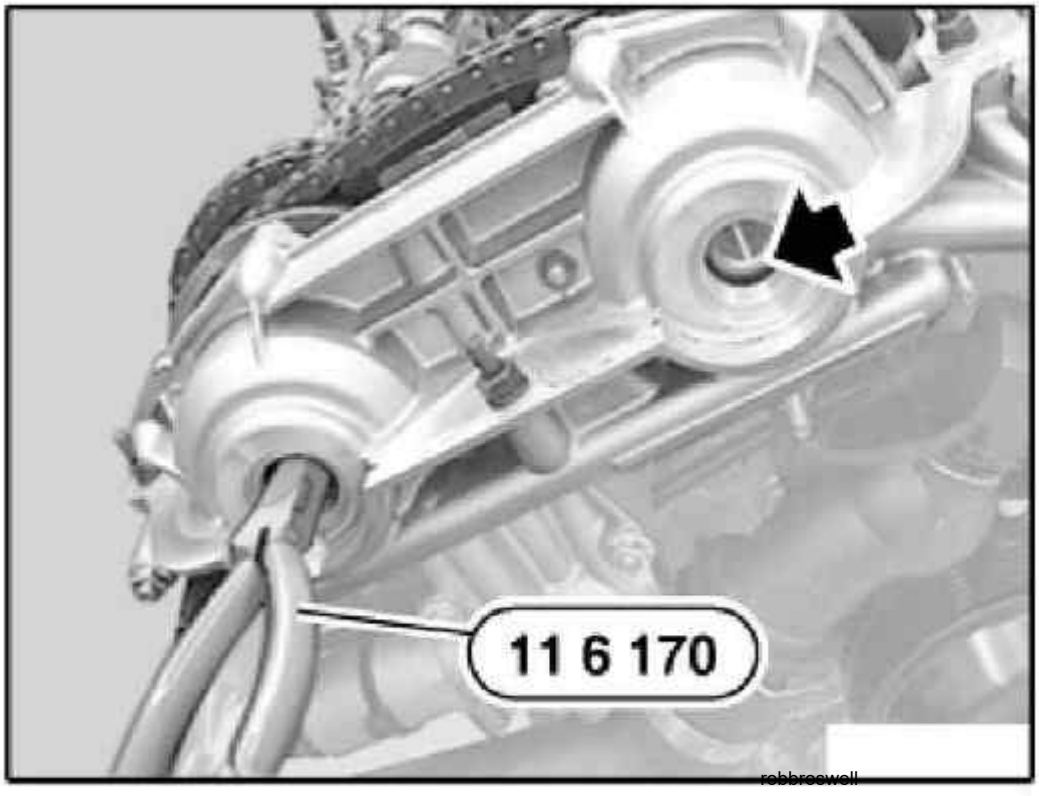


Fig. 318: Installing Sealing Caps With Special Tool 11 6 170
Courtesy of BMW OF NORTH AMERICA, INC.

Insert screw plugs with new sealing rings and tighten down.

Tightening torque, see 11 36 3AZ in **ENGINE - TIGHTENING TORQUES** .

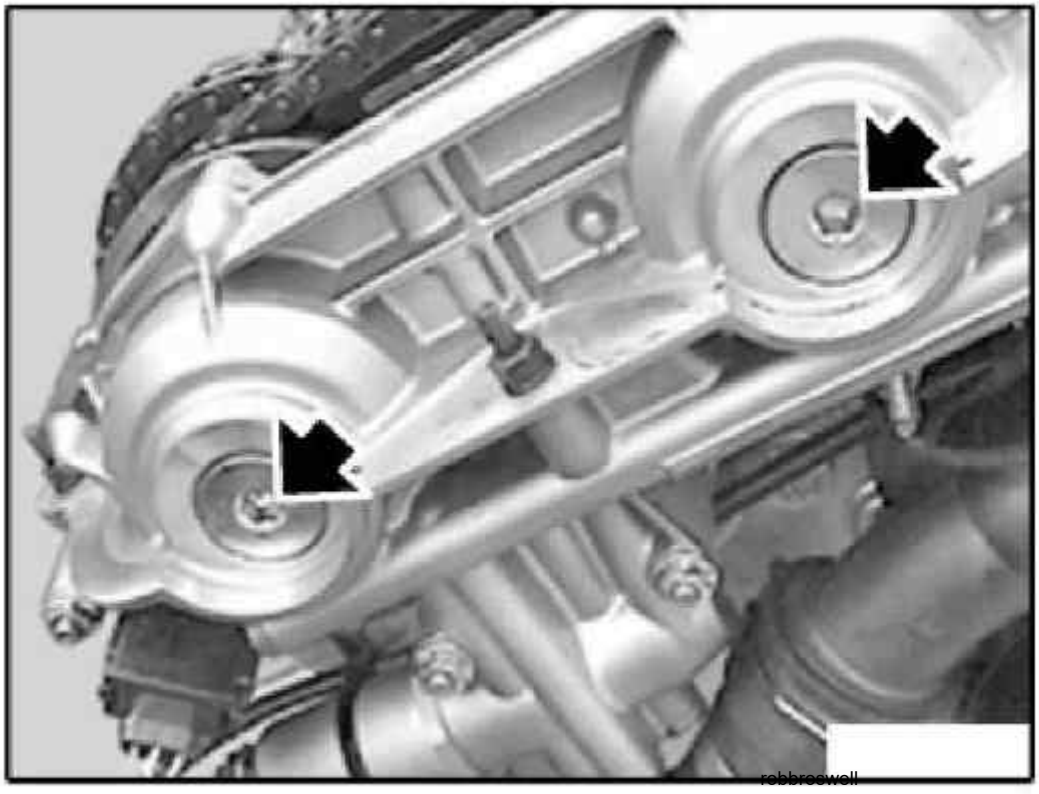


Fig. 319: Tightening Screw Plugs With New Sealing Rings
Courtesy of BMW OF NORTH AMERICA, INC.

Fit suspension lug.

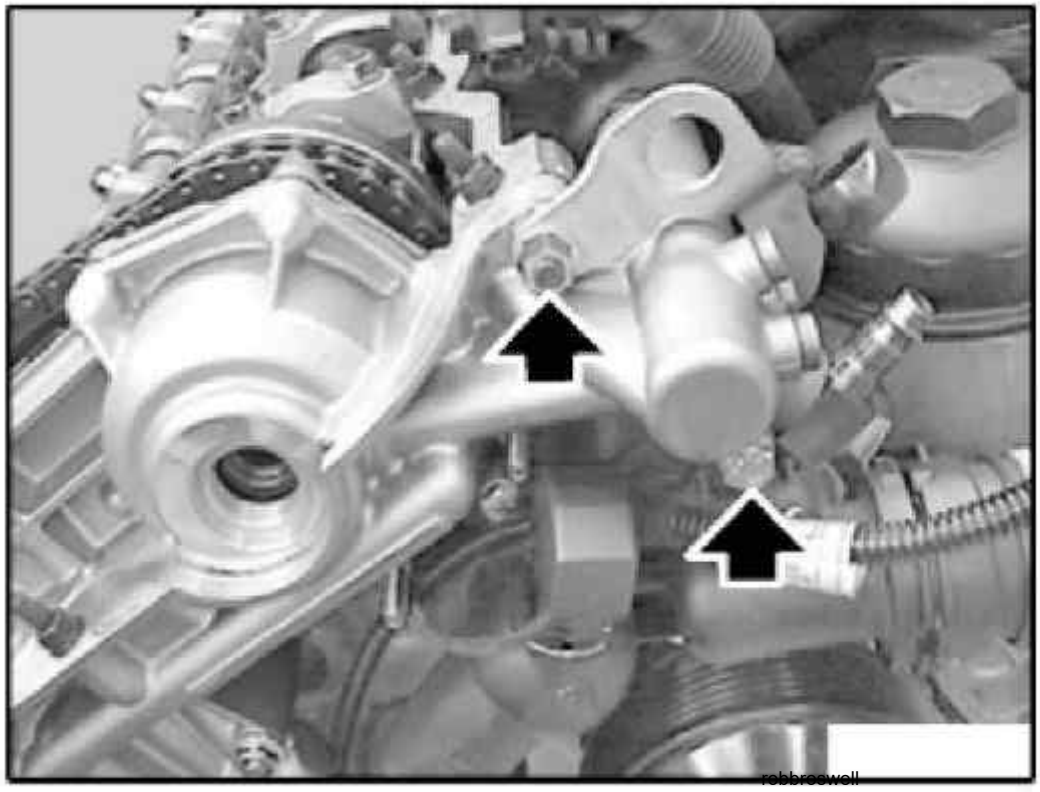


Fig. 320: Fitting Suspension Lug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: If the double VANOS adjustment unit has been replaced, you must check and, if necessary, adjust the camshaft timing.

If work has been carried out which has "no" effect on the timing and it is assured that the timing adjustment is correct, the timing check described in the following does not have to be conducted.

IMPORTANT: Cylinder for chain tensioning piston is under spring pressure.

Remove cylinder for chain tensioning piston.

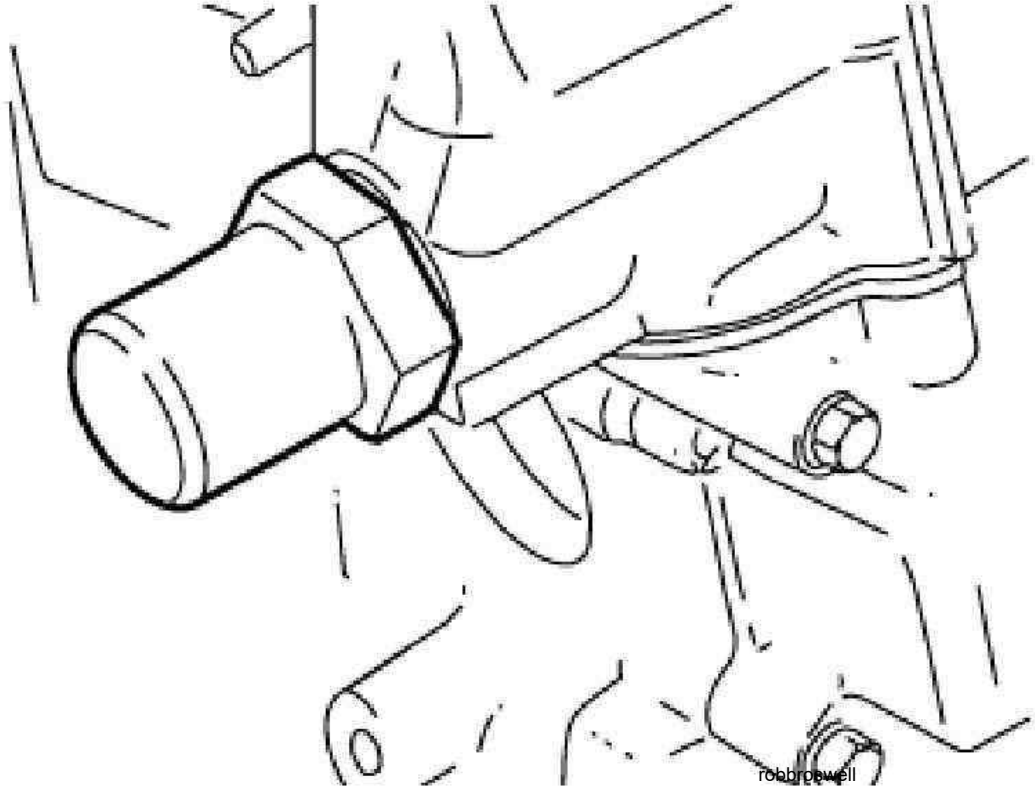


Fig. 321: Removing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Insert special tool 11 4 220 in cylinder head and bring adjustment screw into contact with tensioning rail.

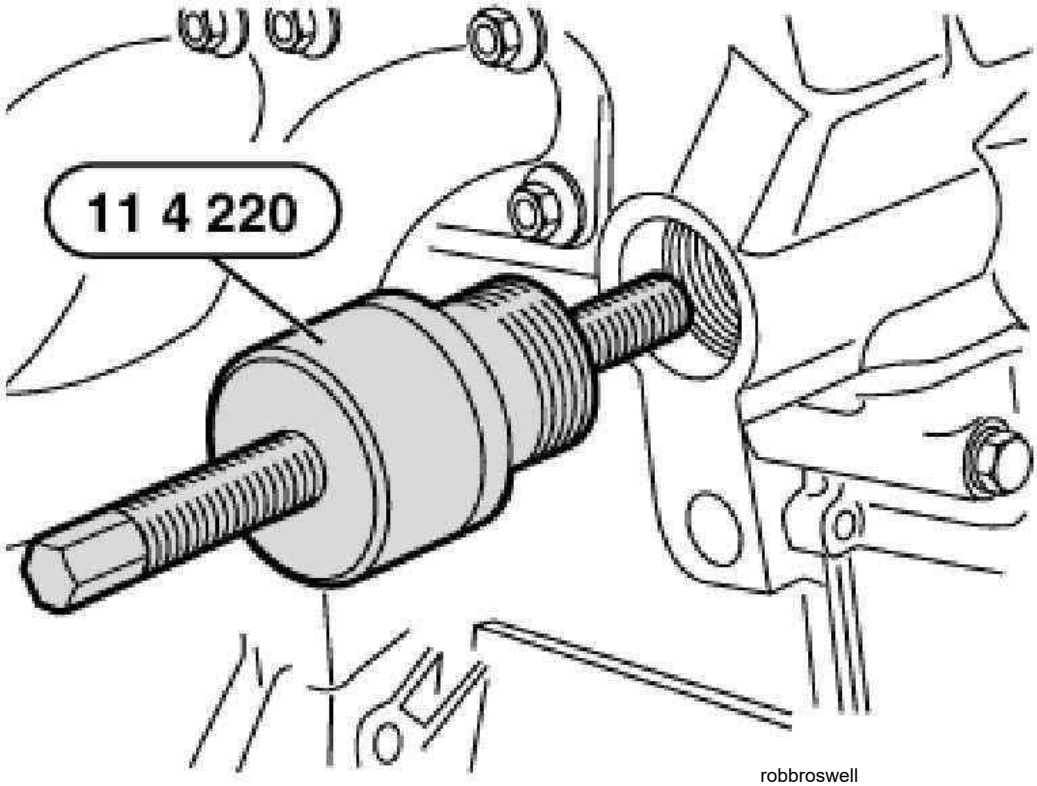
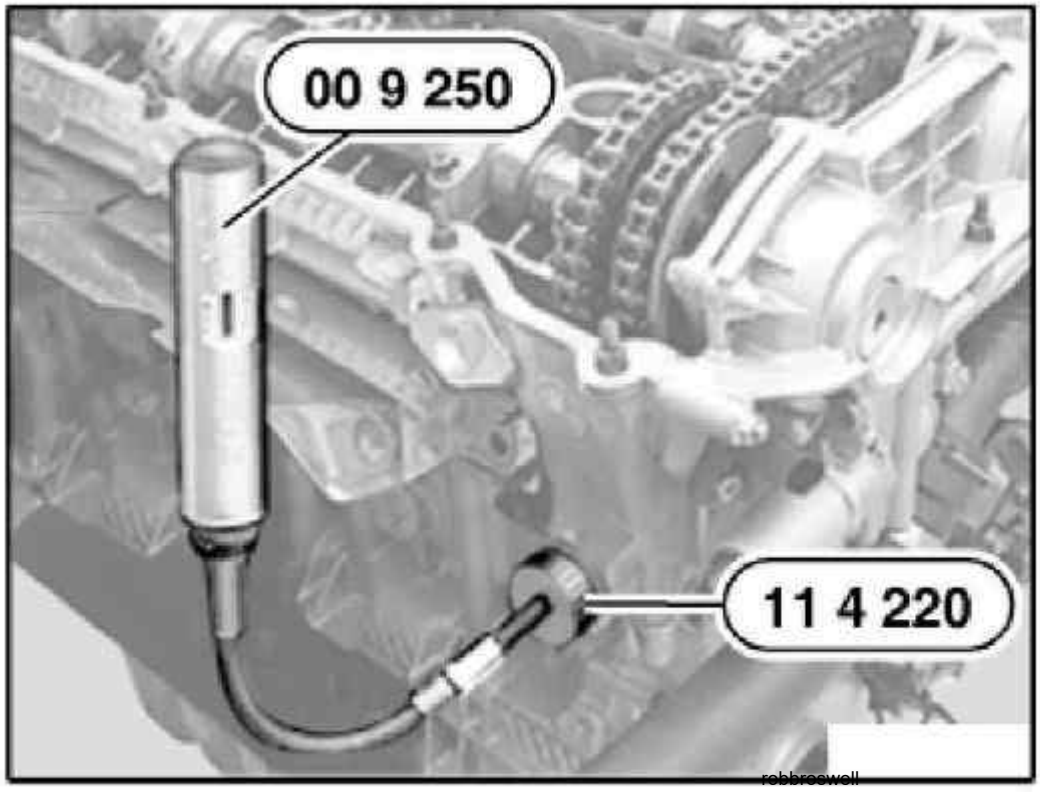


Fig. 322: Inserting Special Tool 11 4 220 In Cylinder Head And Bringing Adjustment Screw Into Contact With Tensioning Rail
Courtesy of BMW OF NORTH AMERICA, INC.

Preload tensioning rail with special tool 11 4 220 by rotating adjusting screw with special tool 00 9 250 or standard torque wrench to 0.7 Nm.



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Fig. 323: Preloading Tensioning Rail With Special Tool 11 4 220 By Rotating Adjusting Screw With Special Tool 00 9 250]
Courtesy of BMW OF NORTH AMERICA, INC.

Pull special tool 11 2 300 back until flywheel is no longer secured in position.

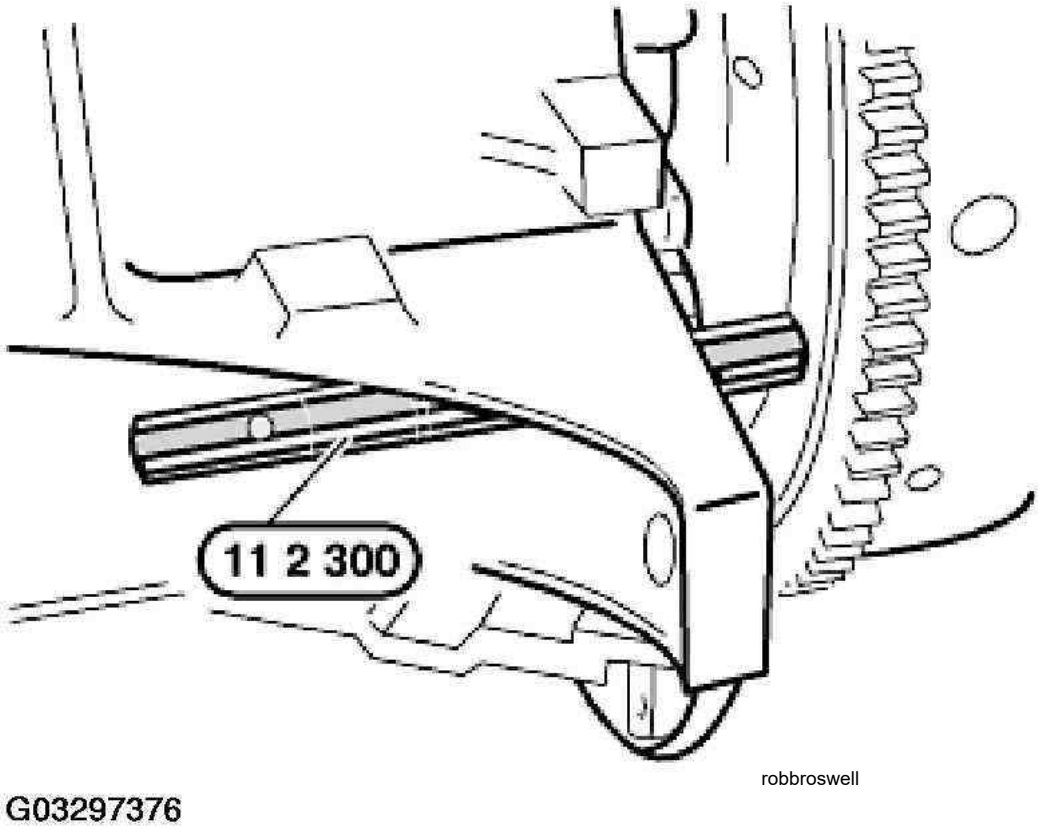


Fig. 324: Pulling Special Tool 11 2 300 Back Until Flywheel Secured In Position
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 240.

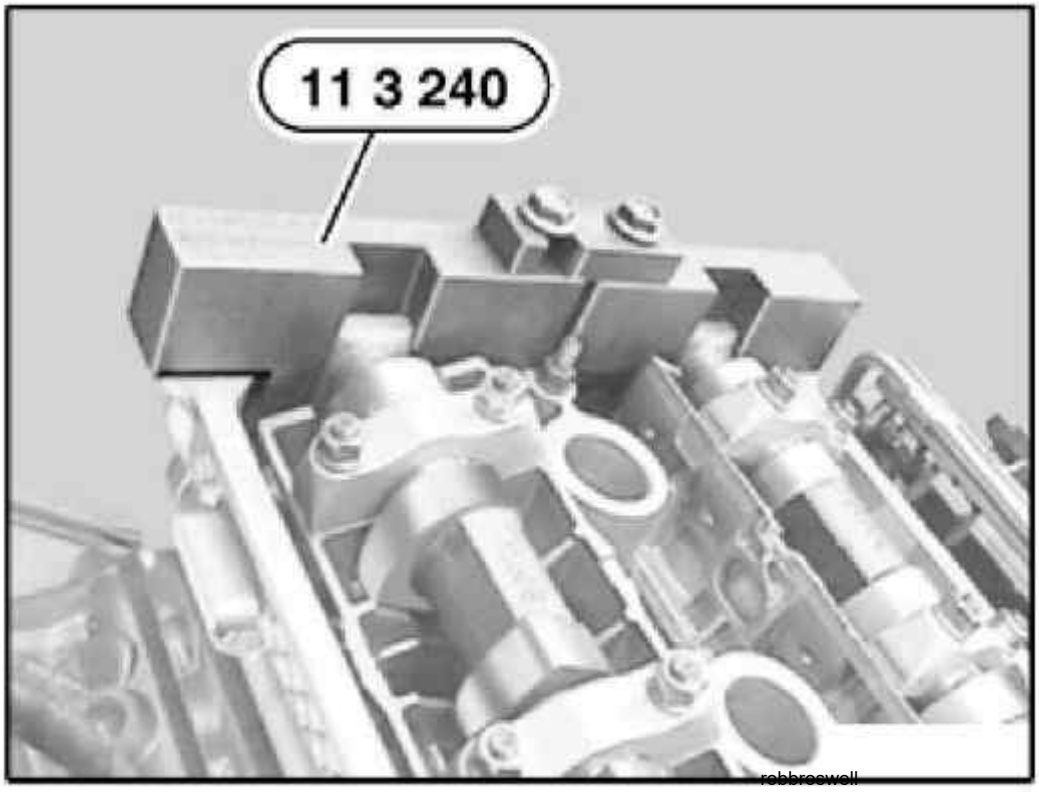


Fig. 325: Removing Special Tool 11 3 240
Courtesy of BMW OF NORTH AMERICA, INC.

IMPORTANT: Cover double VANOS adjustment unit; when the compressed air supply is connected, several drops of oil are sprayed out of the bore.

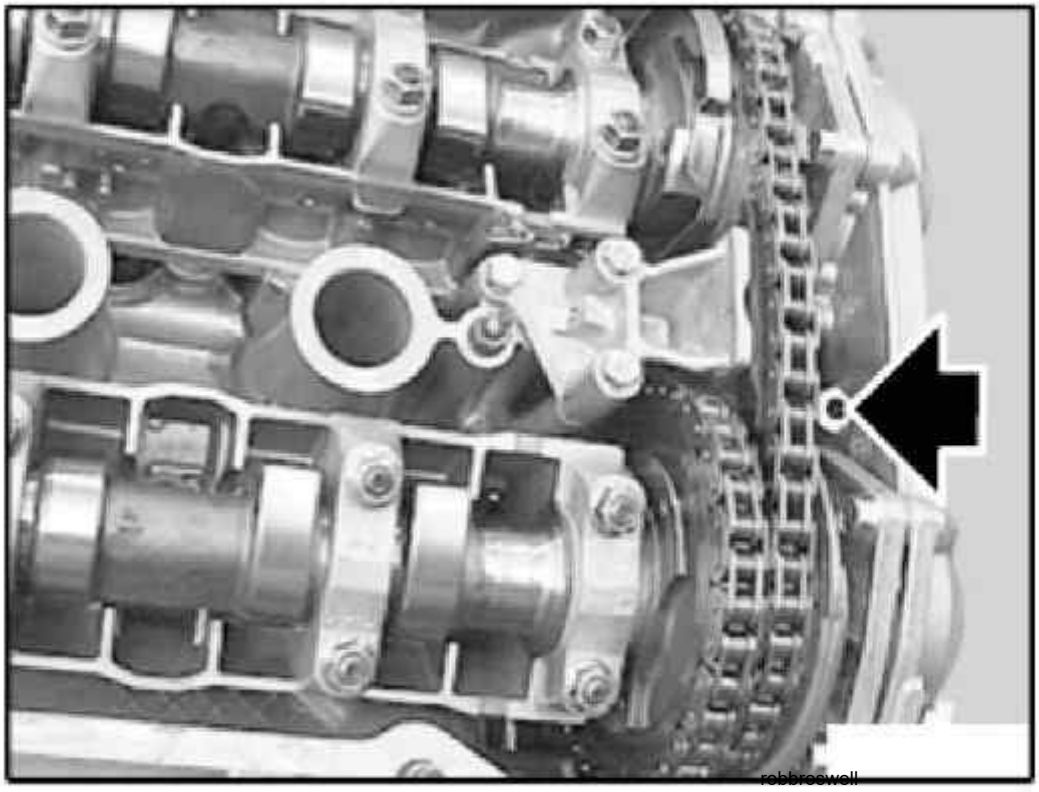
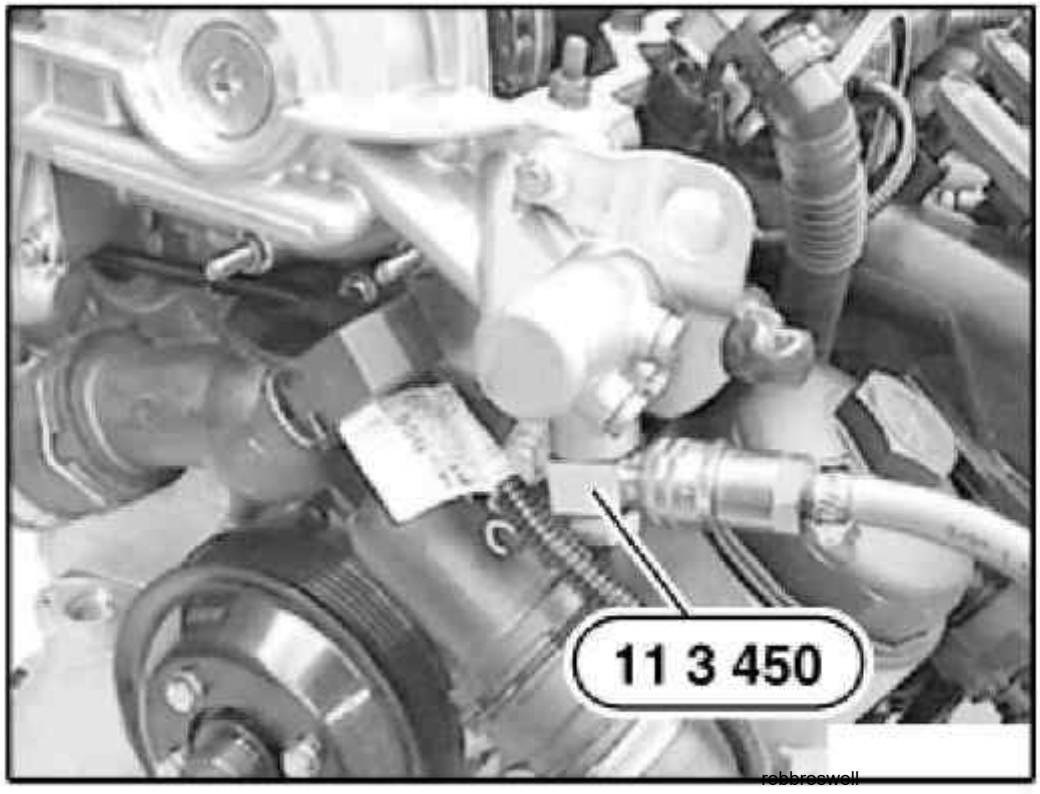


Fig. 326: [Identifying Bore]
Courtesy of BMW OF NORTH AMERICA, INC.

Connect compressed air (2 to 8 bar).



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Fig. 327: Connecting Compressed Air (2 To 8 Bar)
Courtesy of BMW OF NORTH AMERICA, INC.

With compressed air supply connected, crank engine twice in direction of rotation until cam tips on inlet and exhaust camshafts on 1st cylinder face each other.

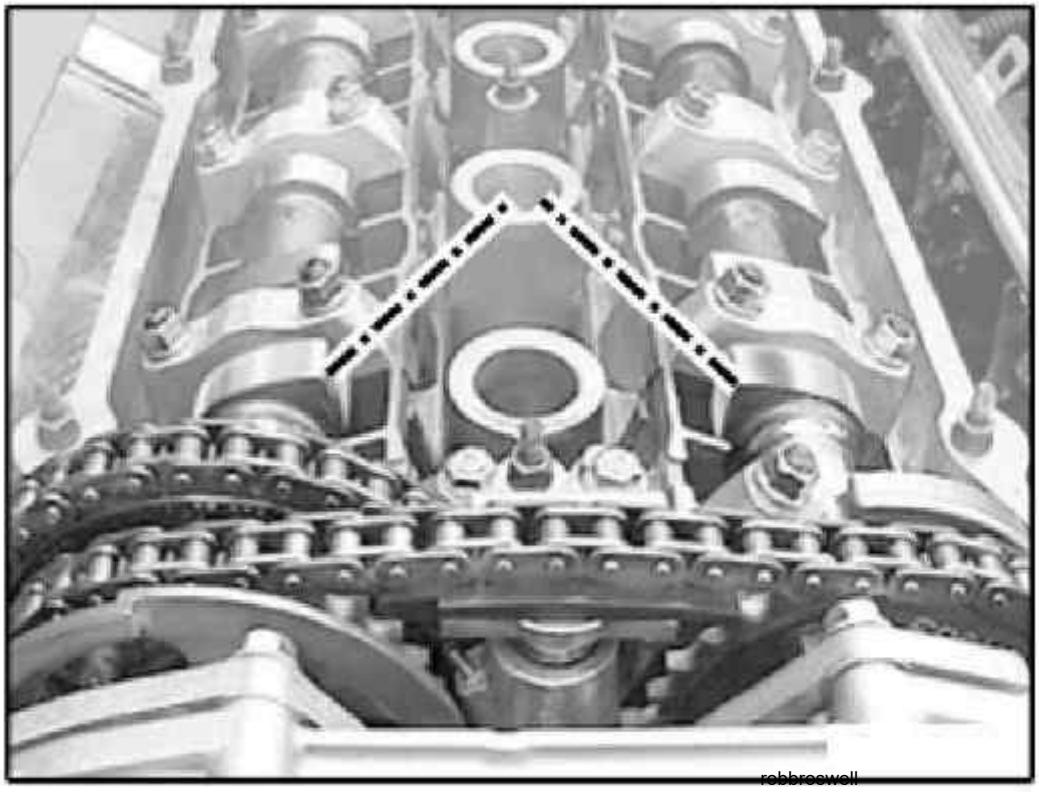


Fig. 328: Identifying Position Of Cam Tips On Inlet And Exhaust Camshafts On 1st Cylinder Face Each Other
Courtesy of BMW OF NORTH AMERICA, INC.

Secure crankshaft with special tool 11 2 300 in TDC position of 1st cylinder.

IMPORTANT: Do not turn the engine back.
Remove special tool 11 2 300 before switching on the engine.

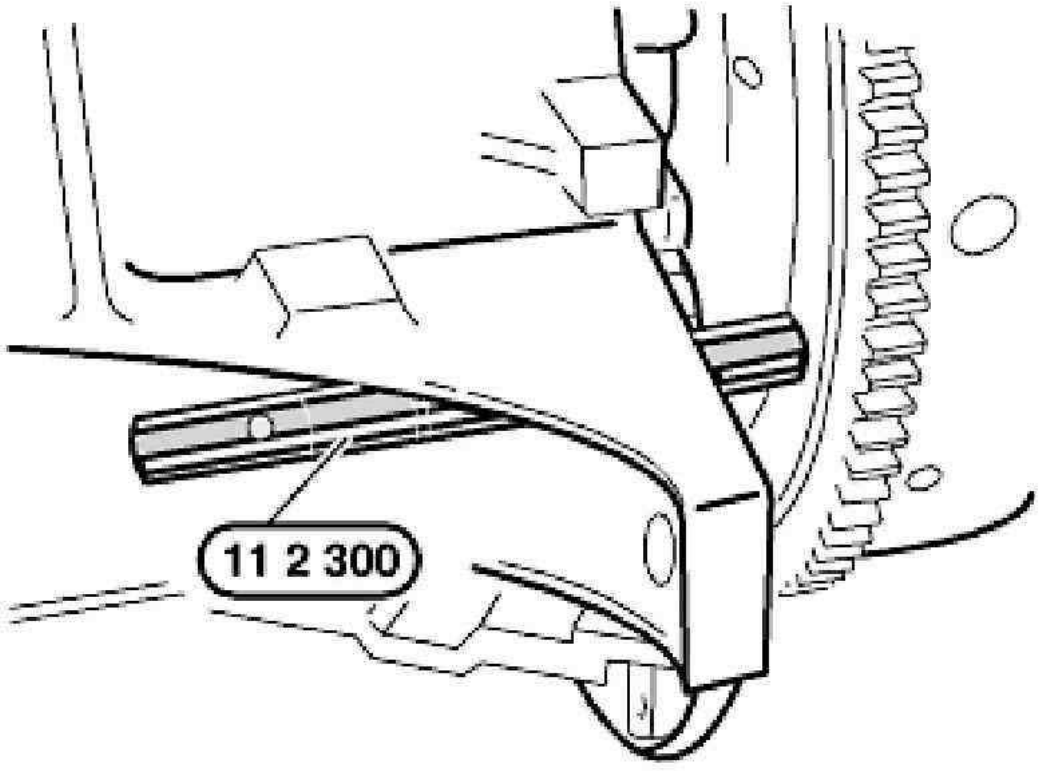


Fig. 329: Securing Crankshaft With Special Tool 11 2 300 In TDC Position Of 1st Cylinder
Courtesy of BMW OF NORTH AMERICA, INC.

Check camshaft setting:

Fit special tool 11 3 240 to camshafts.

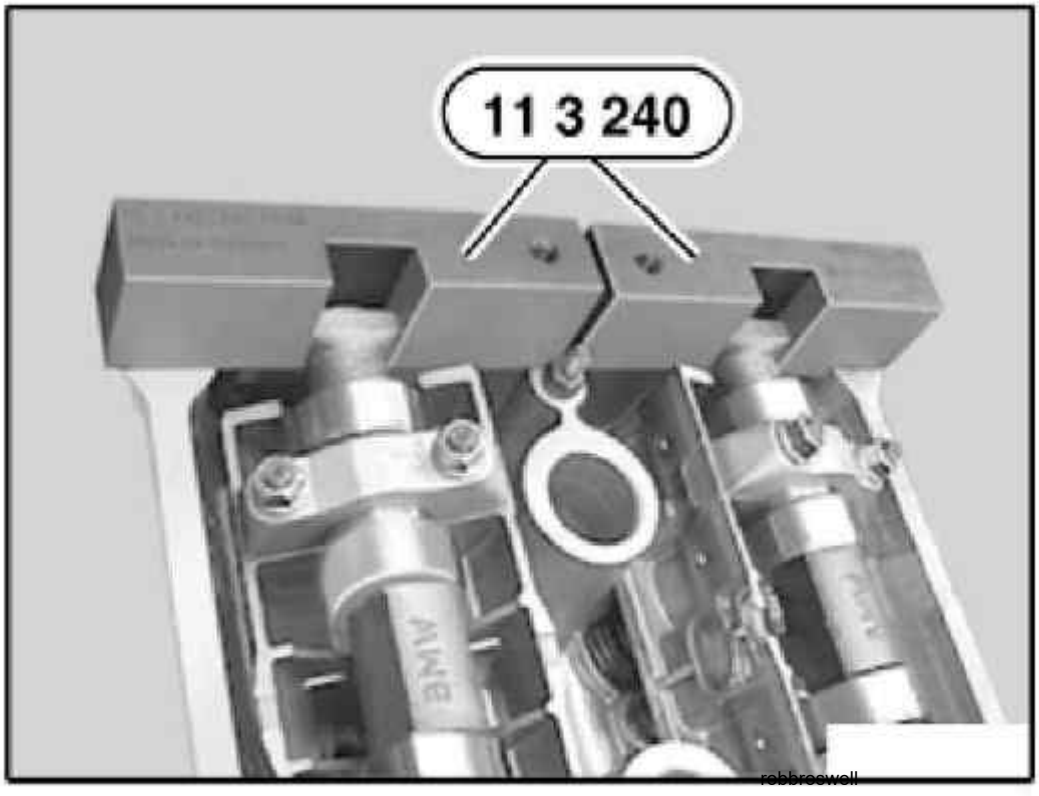


Fig. 330: Fitting Special Tool 11 3 240 To Camshafts
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The timing is correctly set if the special tool 11 3 240 rests without a gap on the cylinder head or protrudes up to 1 mm to the inlet side.

The timing must be reset if the special tool 11 3 240 protrudes to the exhaust side.

If necessary, adjust camshaft timing .

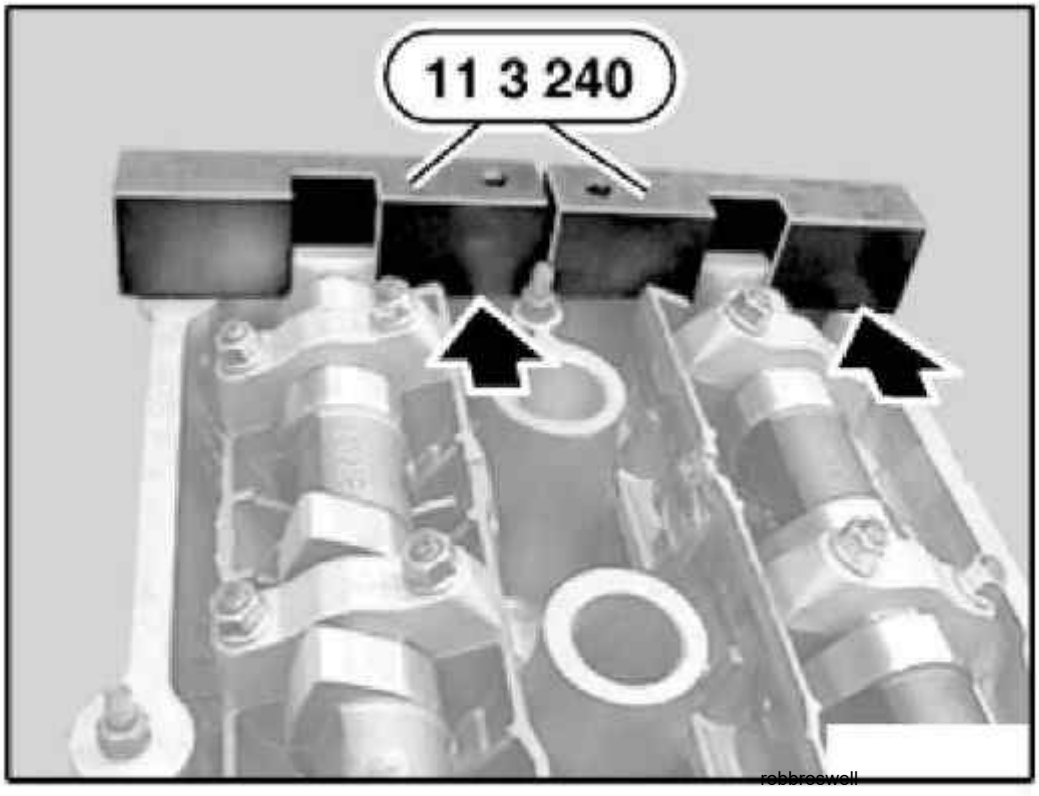


Fig. 331: Resting Special Tool 11 3 240 Without Gap On Cylinder Head
Courtesy of BMW OF NORTH AMERICA, INC.

Detach compressed air connection.

Remove special tool 11 3 450.

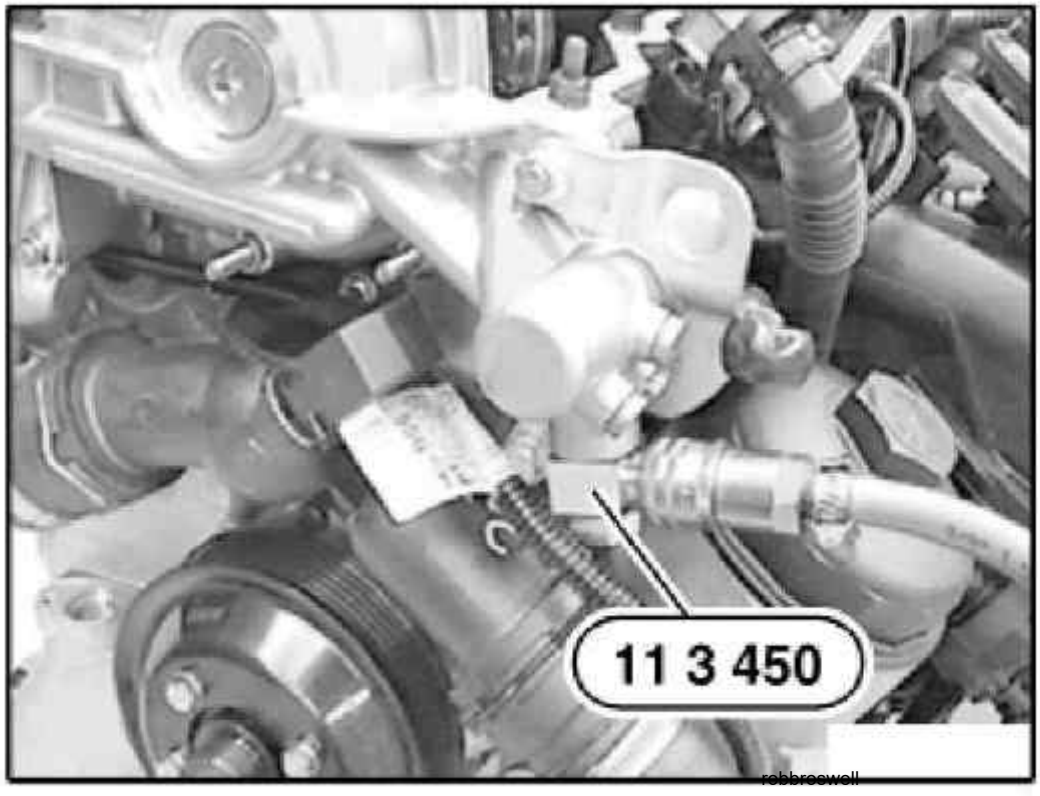


Fig. 332: Removing Special Tool 11 3 450
Courtesy of BMW OF NORTH AMERICA, INC.

Fit oil pressure line with new seals.

Tightening torque, see 11 36 2AZ in **ENGINE - TIGHTENING TORQUES** .

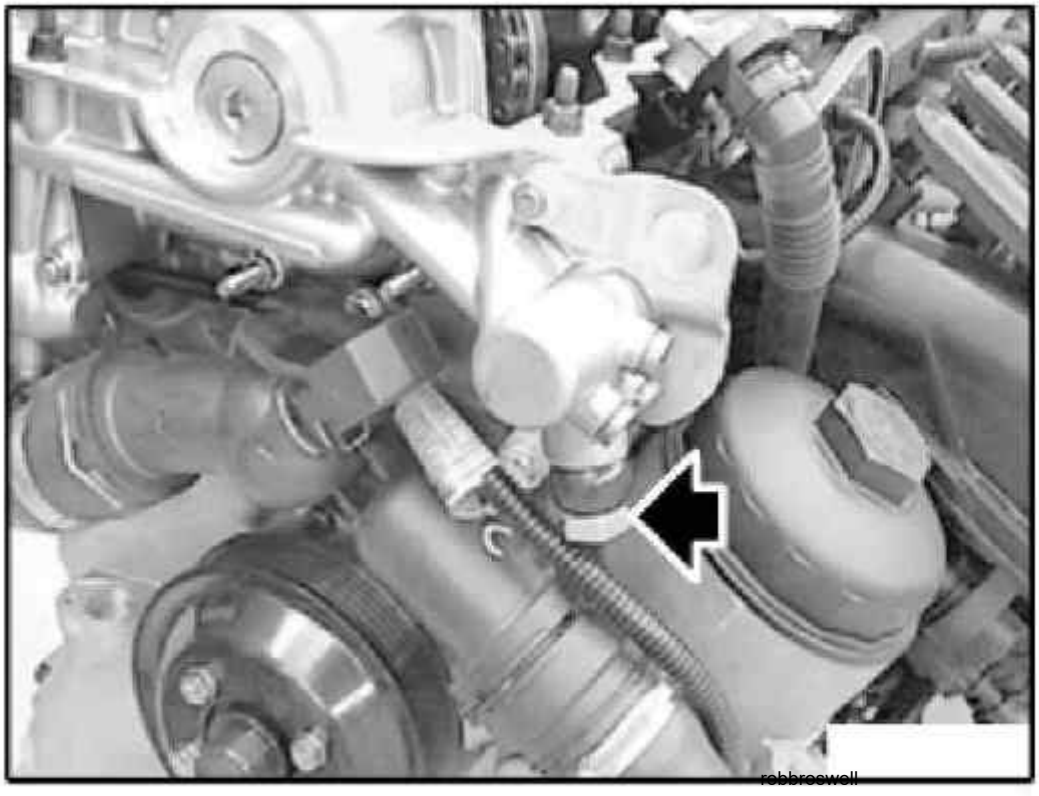


Fig. 333: Fitting Oil Pressure Line With New Seals
Courtesy of BMW OF NORTH AMERICA, INC.

Unfasten and remove special tool 11 4 220.

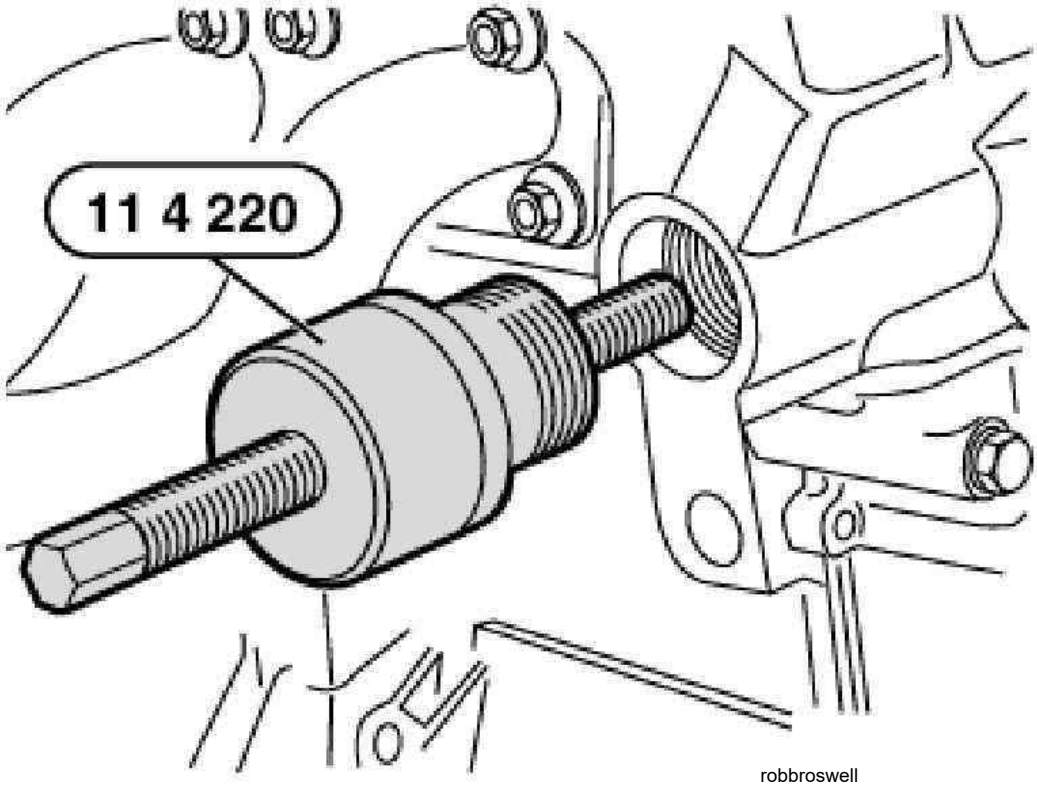


Fig. 334: Removing Special Tool 11 4 220
Courtesy of BMW OF NORTH AMERICA, INC.

Install cylinder for chain tensioning piston .

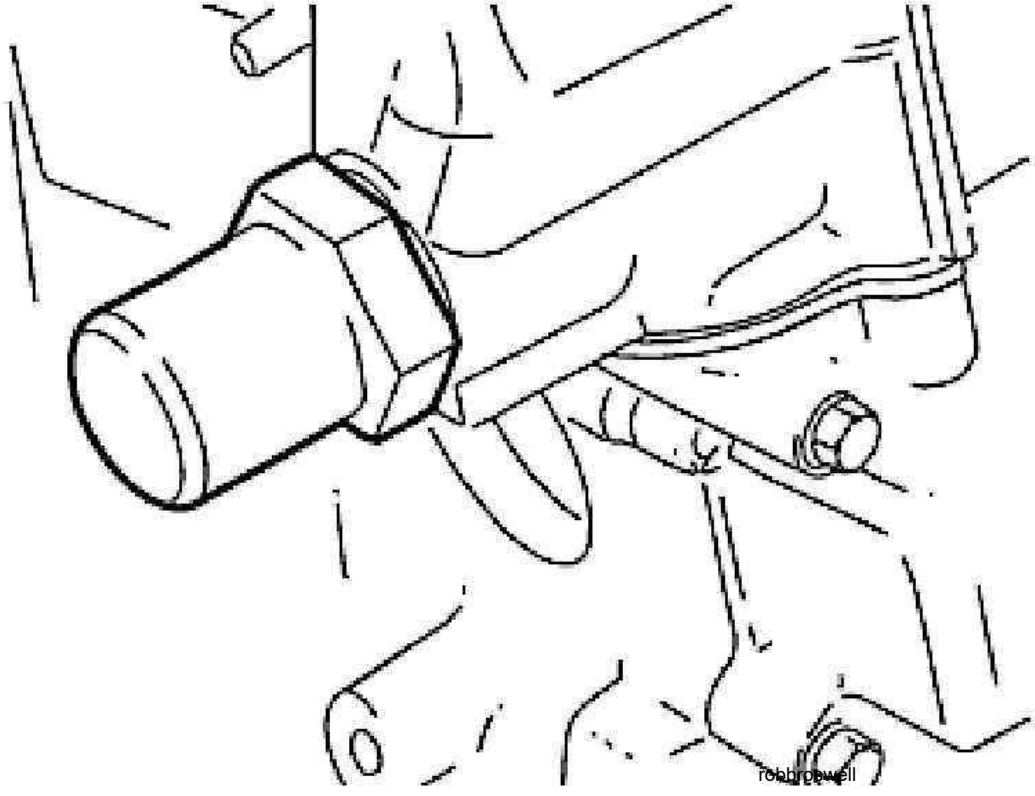


Fig. 335: Installing Cylinder For Chain Tensioning Piston
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 3 240.

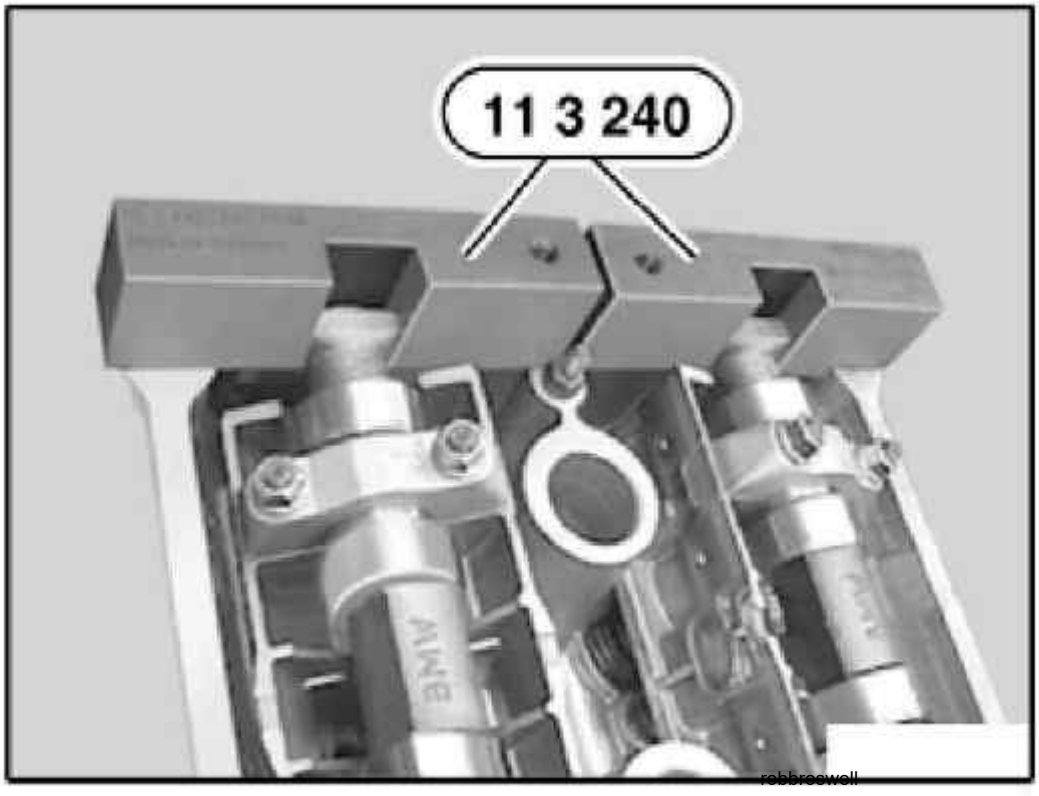


Fig. 336: Removing Special Tool 11 3 240
Courtesy of BMW OF NORTH AMERICA, INC.

Remove special tool 11 2 300.

Assemble engine.

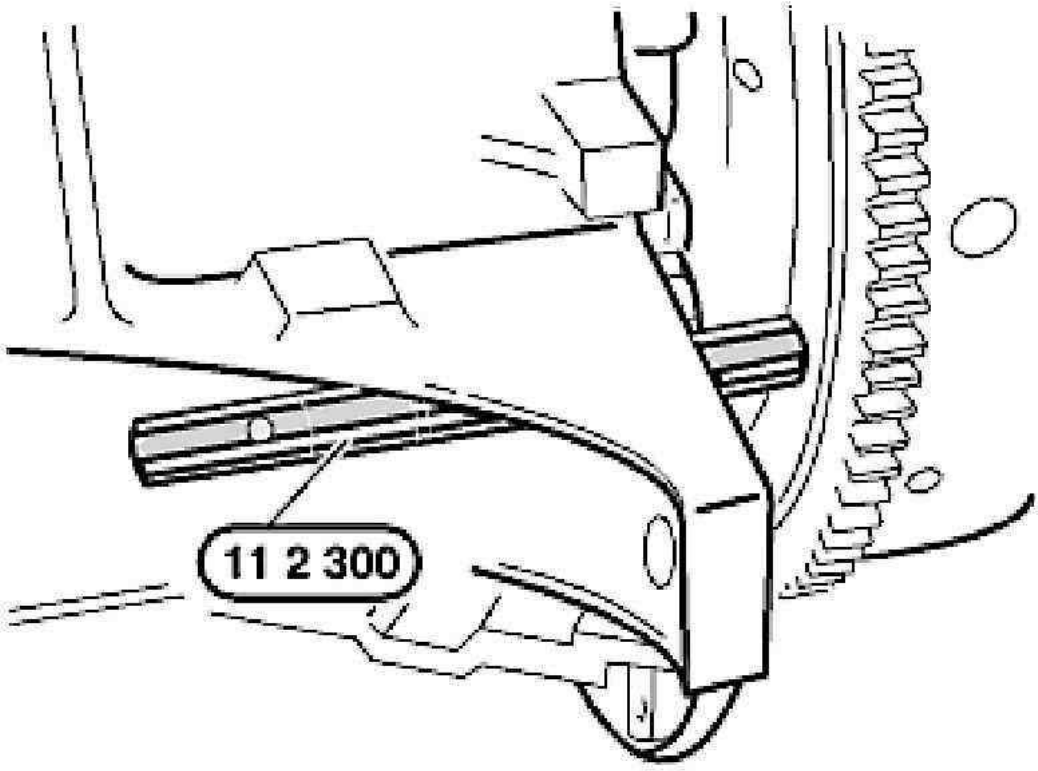


Fig. 337: Removing Special Tool 11 2 300
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 570 REPLACING SOLENOID VALVE FOR INLET SIDE ON VANOS ADJUSTMENT UNIT

Special tools required:

- 32 2 110

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Check stored fault messages
- Switch off ignition

Unlock hose (1) and detach.

Unlock plug (2) and remove.

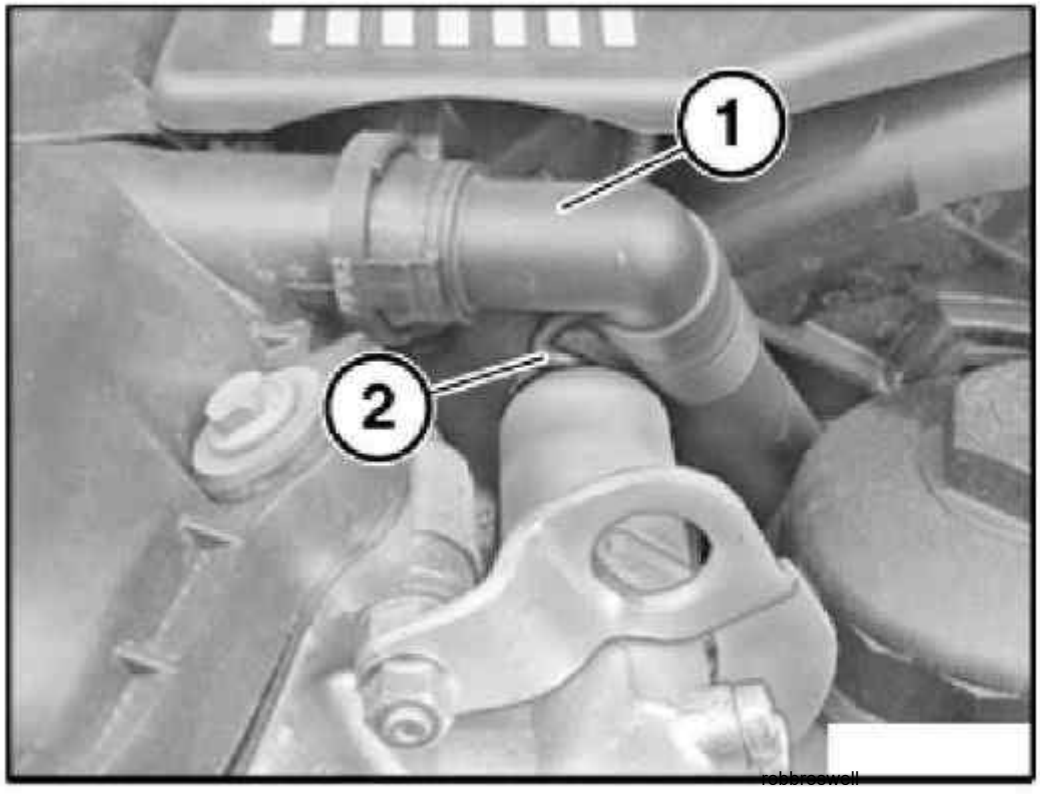


Fig. 338: Removing Hose
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Once it has been removed, oil drips from the solenoid valve.
Have a cleaning cloth ready.
Make sure no oil drips onto the belt drive. Remove any remnants of oil immediately with cleaning cloth.
Do not damage oil line when releasing solenoid valve.
Release solenoid valve with special tool 32 2 110.

Installation:

Tightening torque, see 11 36 1AZ in **ENGINE - TIGHTENING TORQUES** .

Now clear the fault memory.

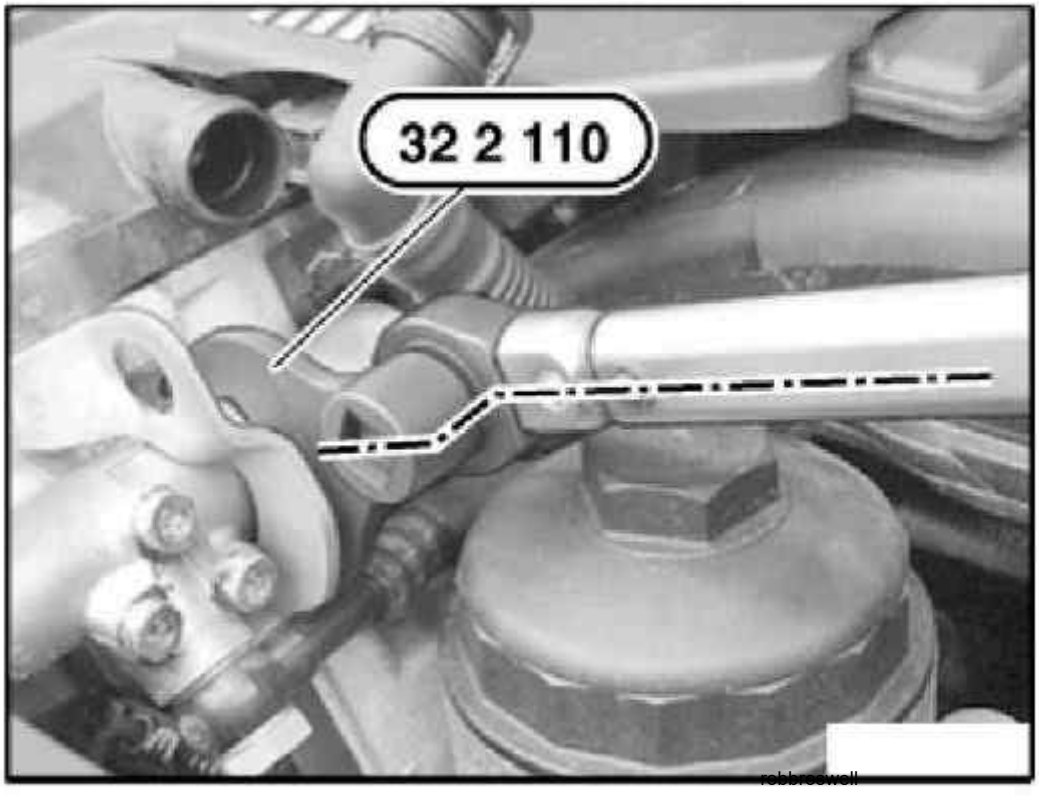


Fig. 339: Releasing Solenoid Valve With Special Tool 32 2 110
Courtesy of BMW OF NORTH AMERICA, INC.

11 36 575 REPLACING SOLENOID VALVE FOR EXHAUST SIDE ON VANOS ADJUSTMENT UNIT

Special tools required:

- 11 6 420

Necessary preliminary tasks:

- Read out fault memory of DME control unit
- Check stored fault messages
- Switch off ignition

E85 only:

- Remove fluid tank for windshield washer system

Unlock plug (1) and remove.

Cut through cable tie (2).

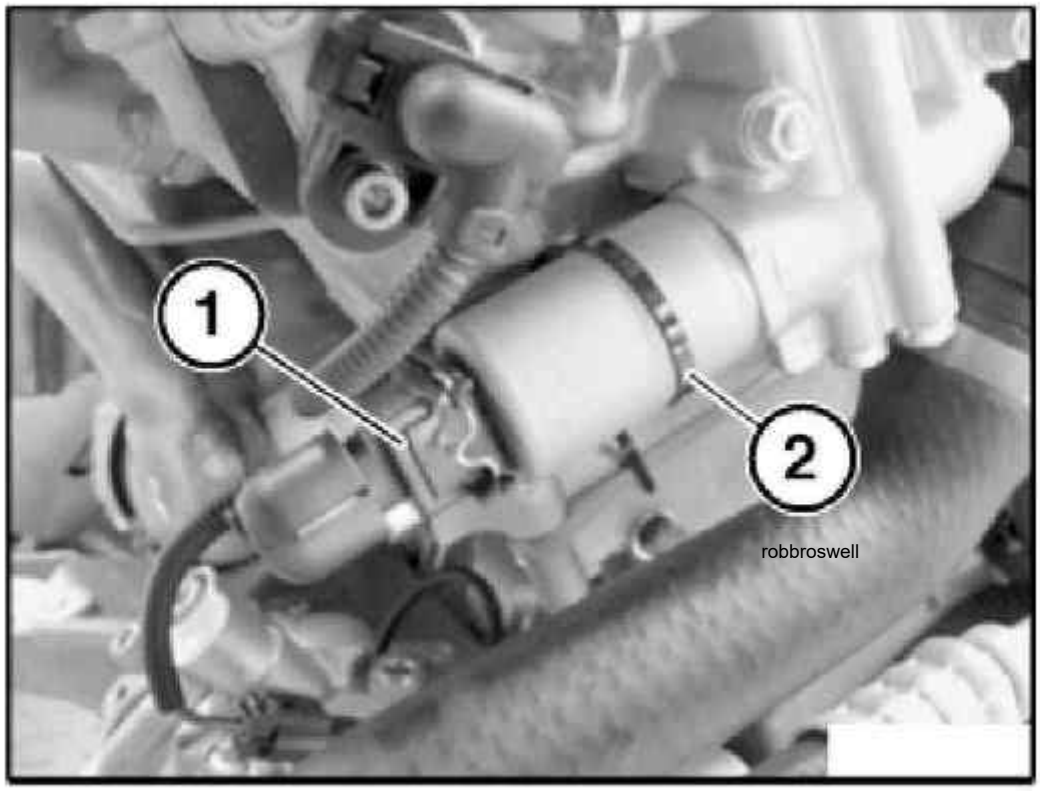


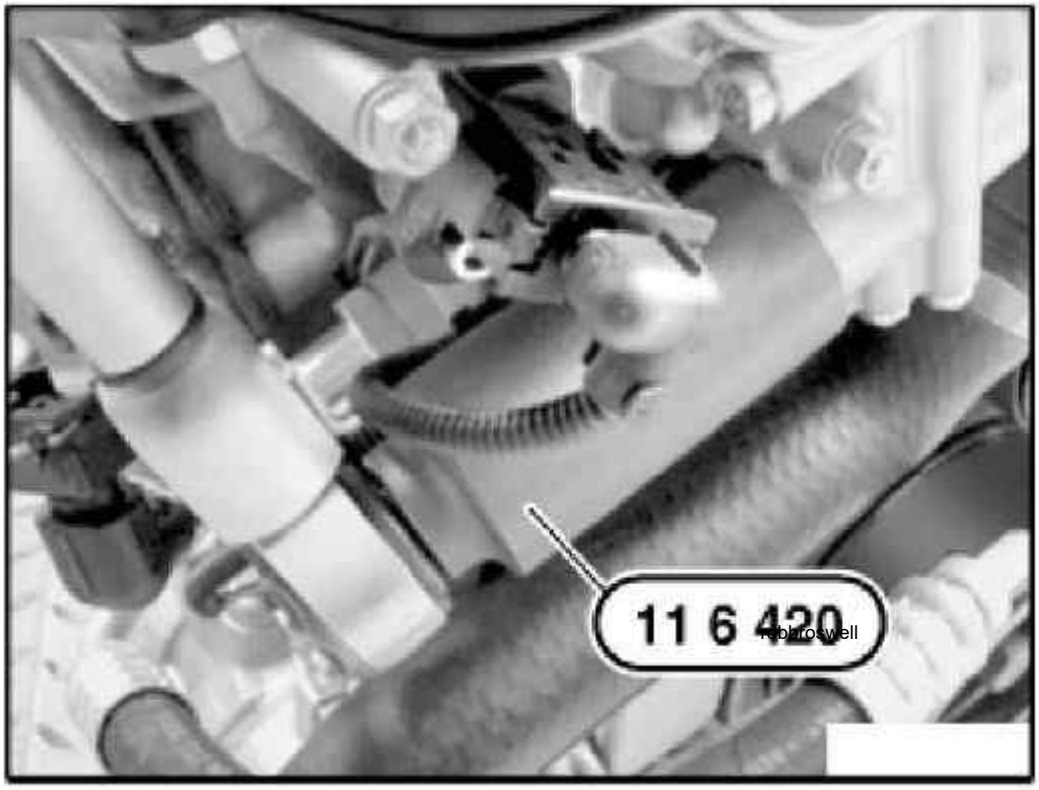
Fig. 340: Removing Plug
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: Once it has been removed, oil drips from the solenoid valve.
Have a cleaning cloth ready.
Make sure no oil drips onto the belt drive. Remove any remnants of oil immediately with cleaning cloth.
Release solenoid valve with special tool 11 6 420.

Installation:

Tightening torque, see 11 36 1AZ in **ENGINE - TIGHTENING TORQUES** .

Now clear the fault memory.



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Fig. 341: Releasing Solenoid Valve With Special Tool 11 6 420
Courtesy of BMW OF NORTH AMERICA, INC.

OIL SUPPLY

11 40 000 CHECKING ENGINE OIL PRESSURE

Special tools required:

- 11 4 050
- 13 3 061
- 13 3 063
- 13 6 051

- 13 6 054

NOTE: For engine oil pressure to be checked, oil pressure switch must be removed and special tools must be installed and connected.

To avoid an excess discharge of oil when removing oil pressure switch:

Unscrew oil filter cap; the engine oil flows out of the oil filter housing into the oil sump.

Installation:

Replace sealing ring.

Tightening torque, see 11 42 2AZ in **ENGINE - TIGHTENING TORQUES** .

Remove oil pressure switch.

Installation:

Tightening torque, see 12 61 1AZ in **ENGINE - TIGHTENING TORQUES** .

Install special tool 11 4 050 with sealing ring (1) in place of oil pressure switch.

robbroswell

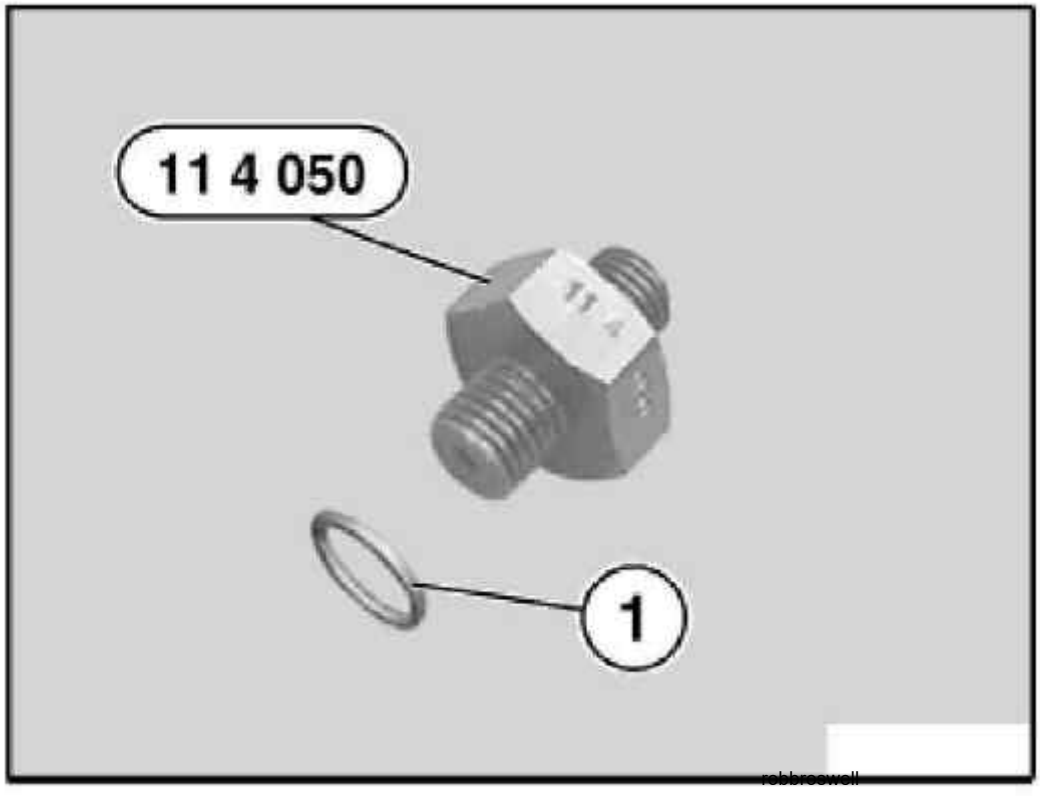


Fig. 342: Installing Special Tool 11 4 050 With Sealing Ring In Place Of Oil Pressure Switch
Courtesy of BMW OF NORTH AMERICA, INC.

Checking engine oil pressure with DIS Tester

Attach special tool 13 6 054 with sealing ring (1) and special tool 13 6 051 and connect to DIS Tester.

Checking engine oil pressure with pressure gauge

Install special tool 13 3 063 and special tool 13 3 061 (pressure gauge).

Start engine and check engine oil pressure.

Specified value .

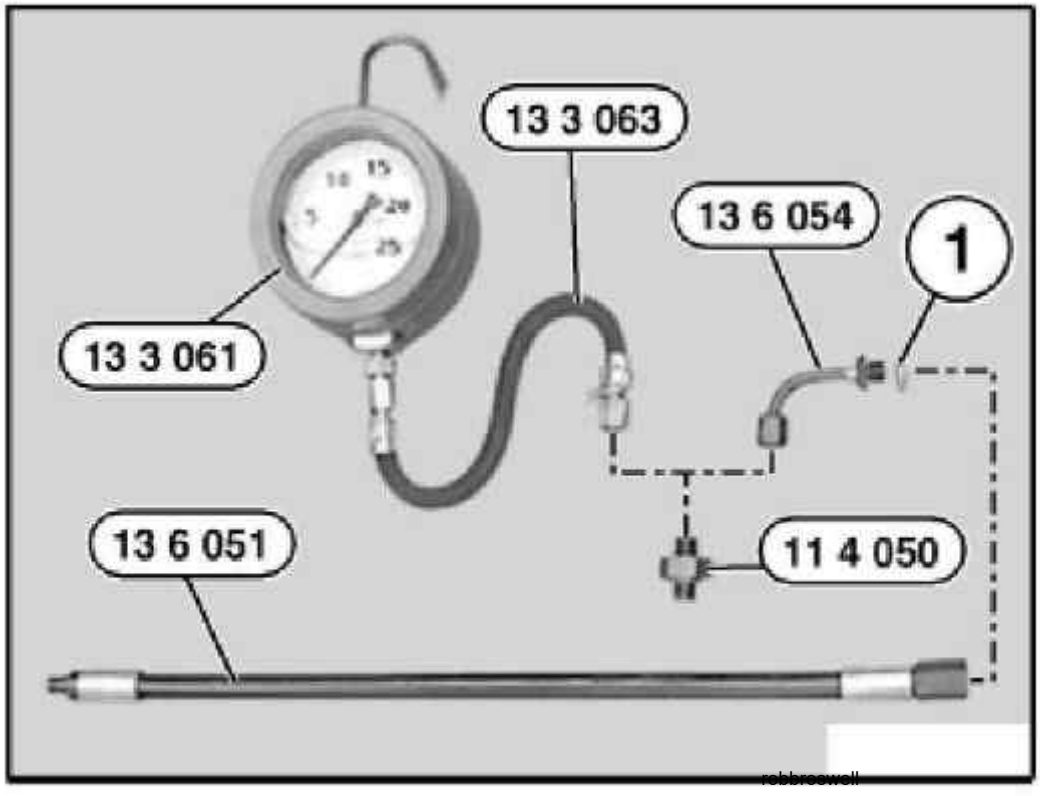


Fig. 343: Checking Engine Oil Pressure With DIS Tester
Courtesy of BMW OF NORTH AMERICA, INC.

OIL PUMP WITH FILTER AND DRIVE

11 41 000 REMOVING AND INSTALLING/REPLACING OIL PUMP (M52TU / M54 / M56)

Remove oil sump . See **11 13 000 Removing And Installing, Sealing Or Replacing Oil Sump (M52TU / M54 / M56)**.

CAUTION: Left-hand threads.
Unfasten nut.

Installation:

Tightening torque, see 11 41 4AZ in **ENGINE - TIGHTENING TORQUES** .

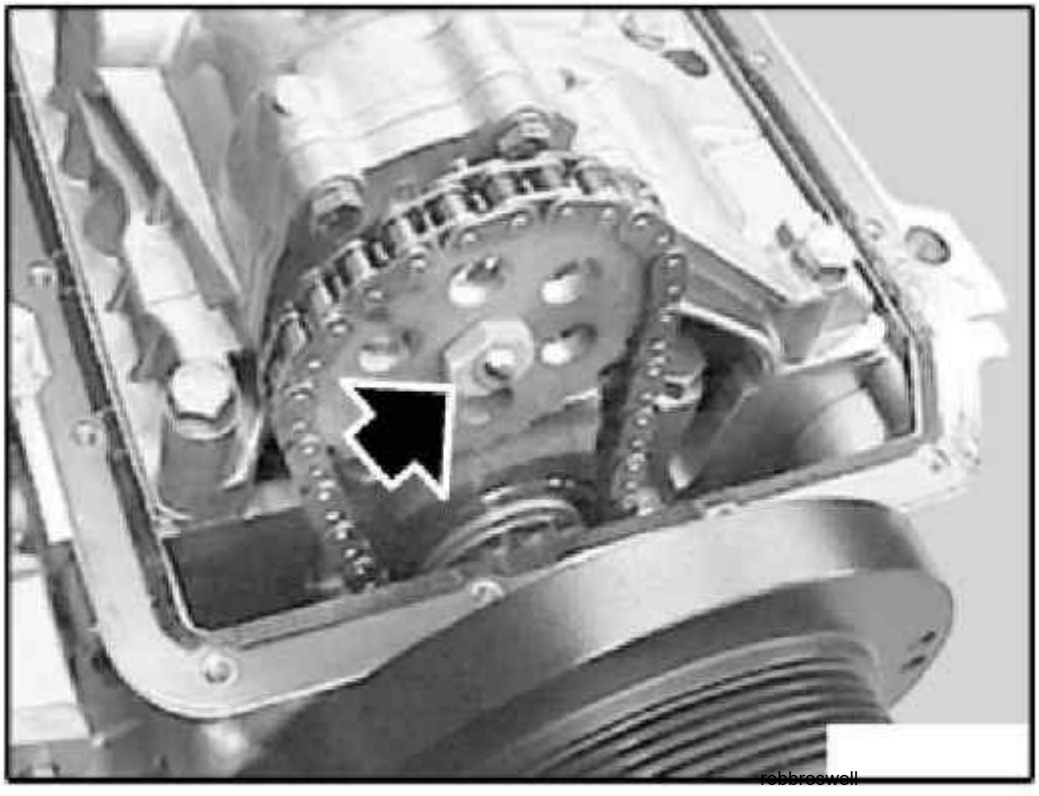


Fig. 344: Unfastening Nut
Courtesy of BMW OF NORTH AMERICA, INC.

Remove sprocket with chain.

Installation:

Align splines of chain wheel and oil pump shaft to each other.

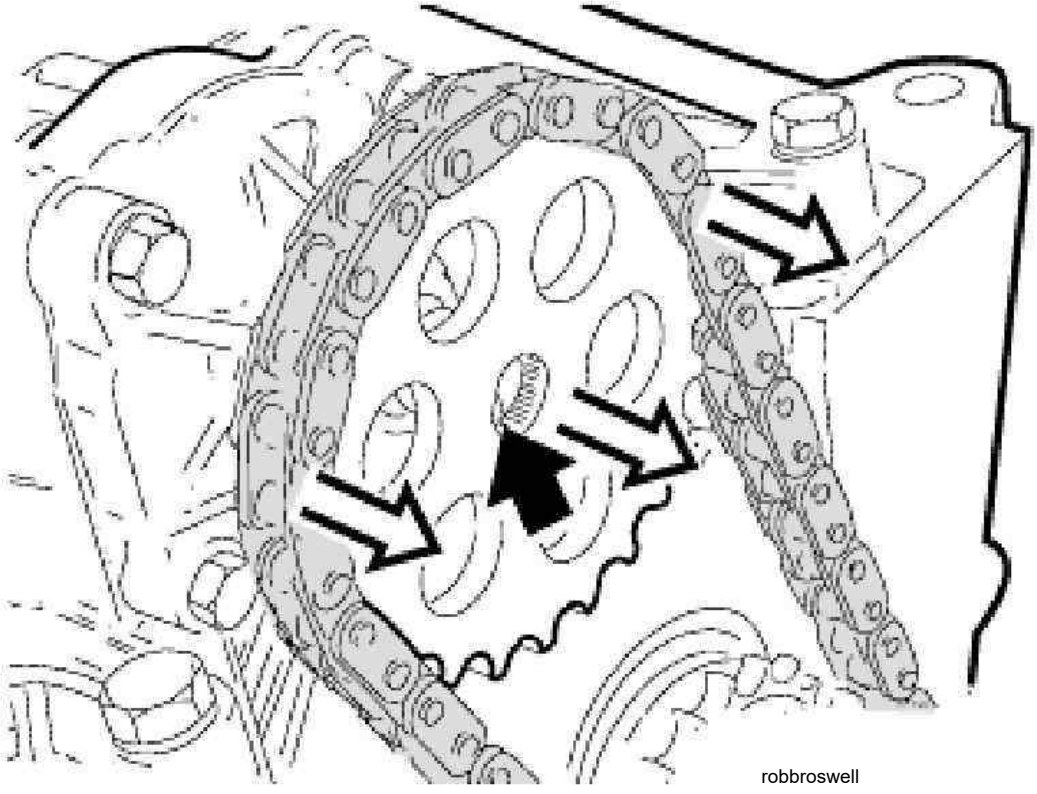


Fig. 345: Removing Sprocket With Chain
Courtesy of BMW OF NORTH AMERICA, INC.

Version 1

Oil pump integrated in oil scraper:

Release screws (1), remove oil pump with oil scraper.

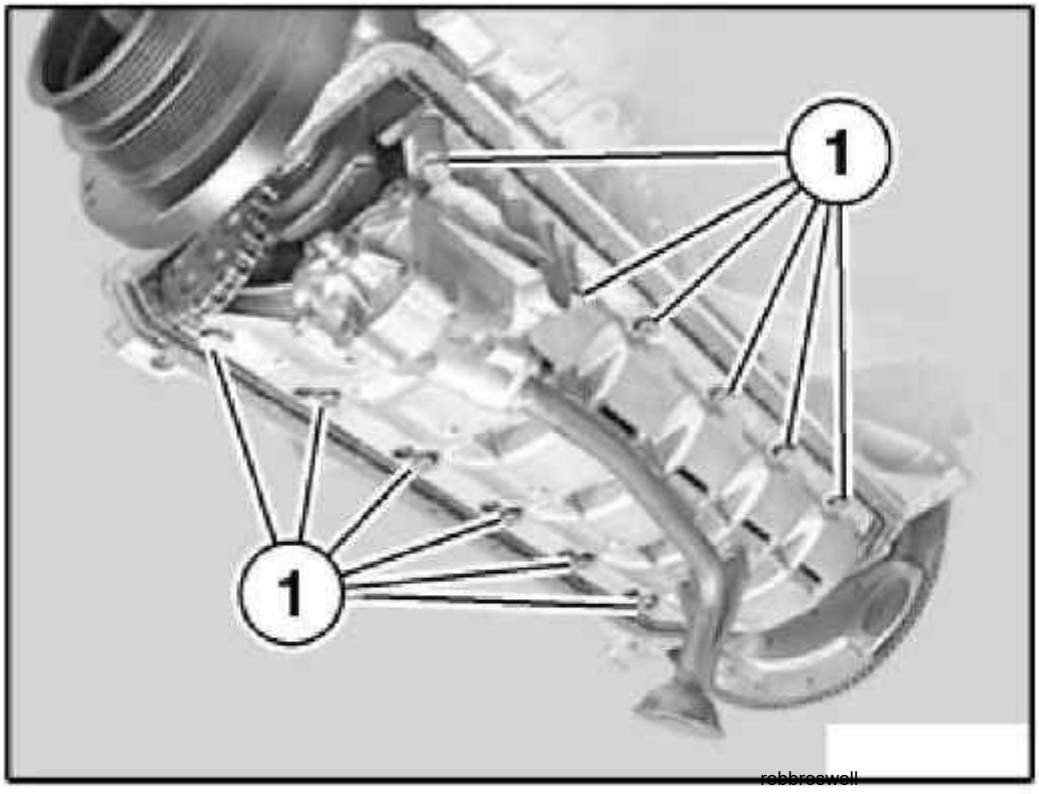


Fig. 346: Removing Oil Pump With Oil Scraper
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Oil pump and oil scraper - two parts:

Release screws and remove oil pump intake pipe.

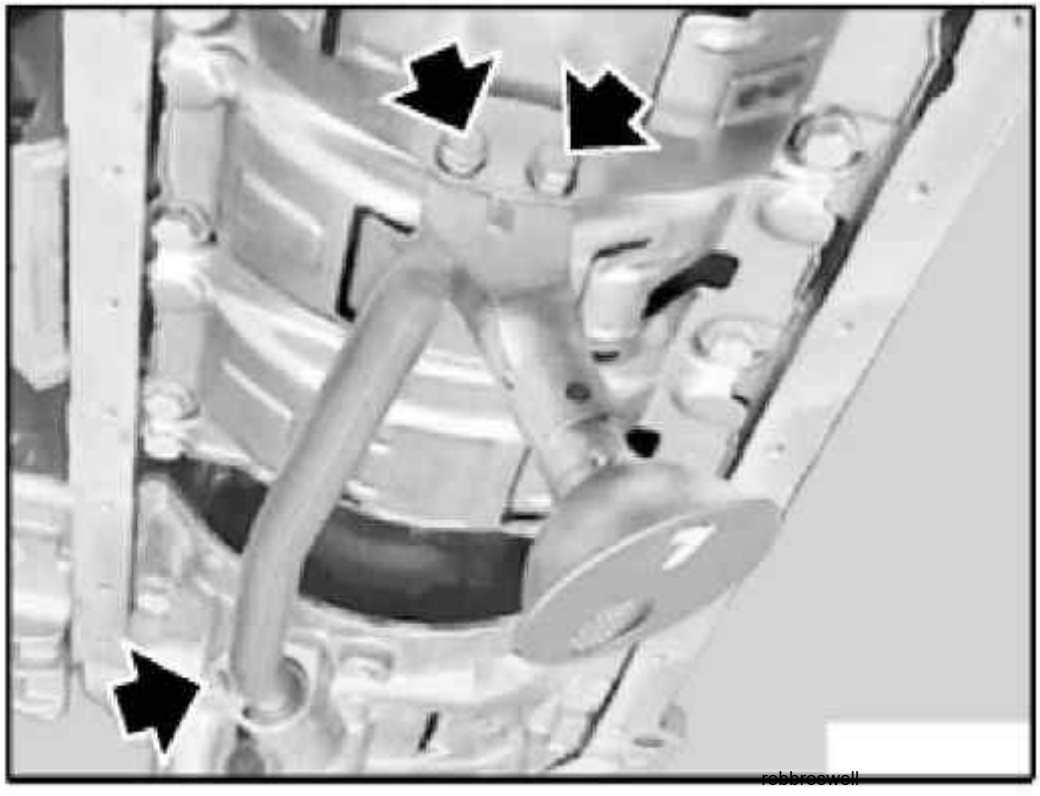


Fig. 347: Removing Oil Pump Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

Version 2

Oil pump and oil scraper - two parts:

Release screws and remove oil pump.

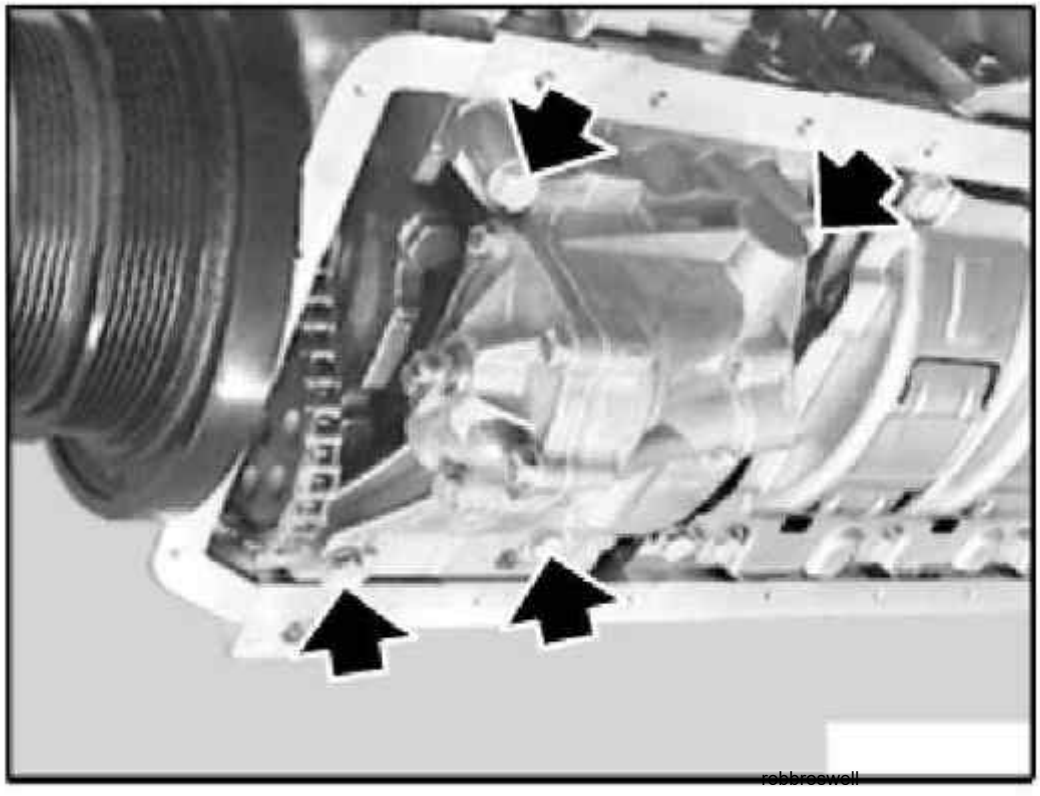
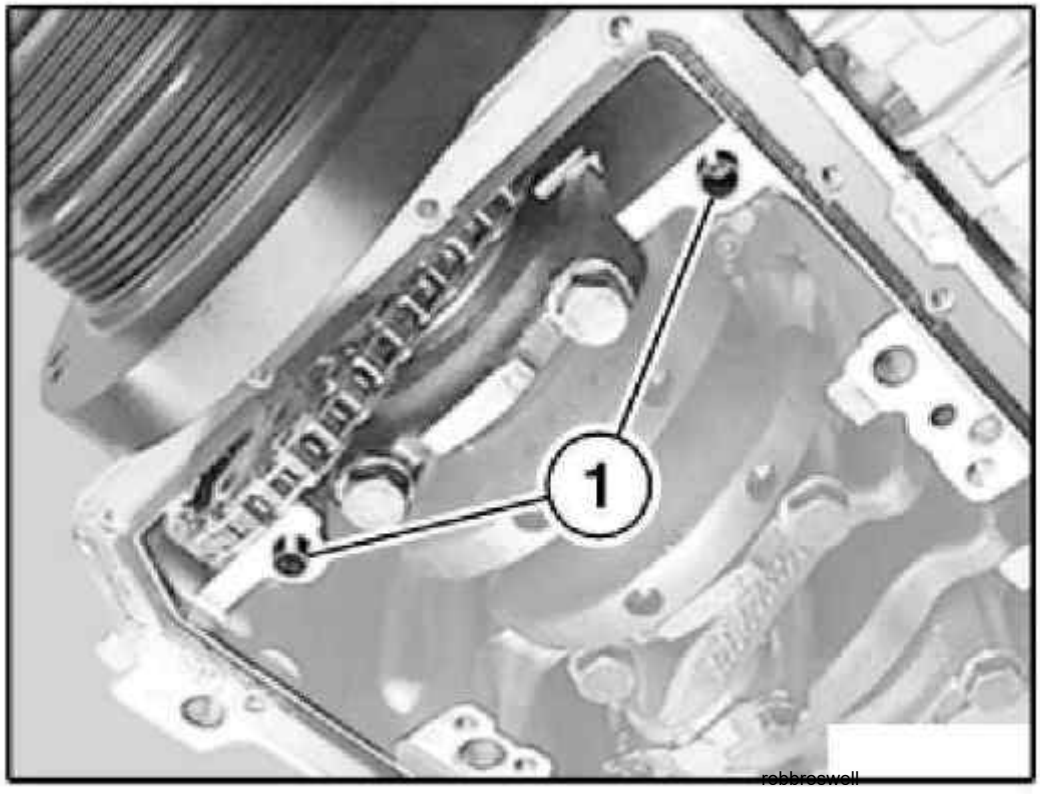


Fig. 348: Removing Oil Pump
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check dowel sleeves (1) for damage and correct installation position.



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Fig. 349: Checking Dowel Sleeves For Damage
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace O-ring on intake pipe.

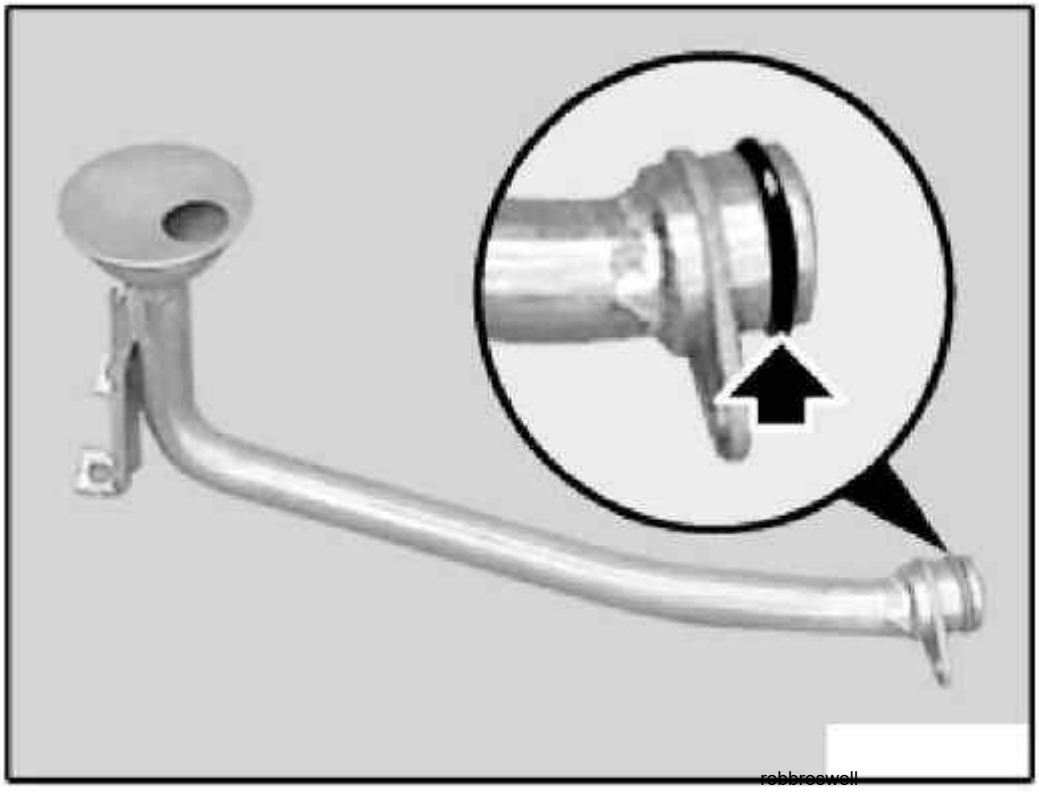


Fig. 350: Replacing O-Ring On Intake Pipe
Courtesy of BMW OF NORTH AMERICA, INC.

If necessary, remove control piston.

Press sleeve downwards with suitable drift.

CAUTION: The sleeve for the control plunger is under spring pressure.

Remove circlip.

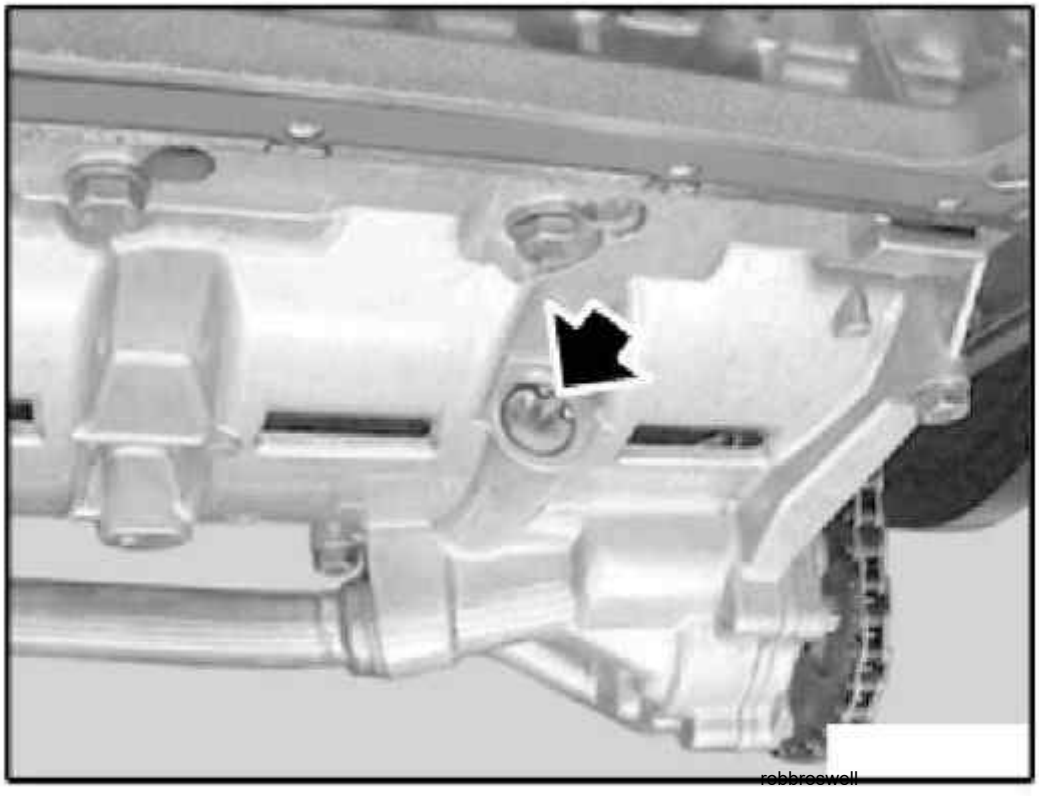


Fig. 351: Removing Circlip
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

1. Control plunger
2. Spring
3. Sleeve
4. O-ring (replace)
5. Circlip

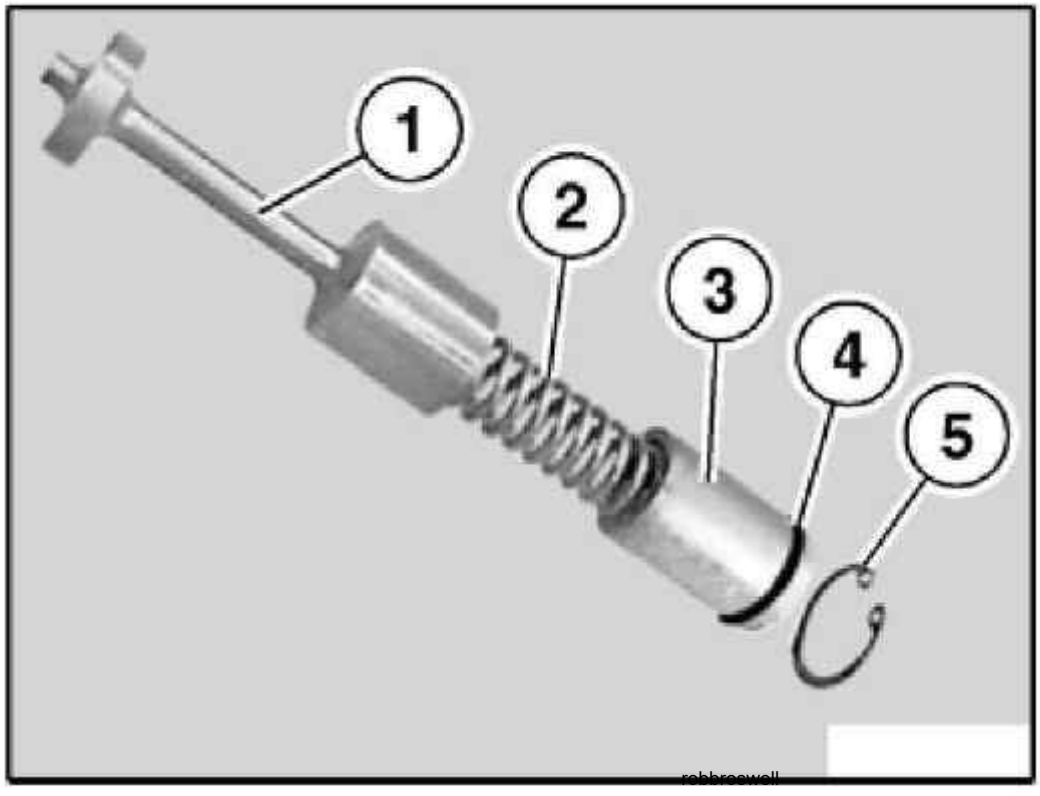


Fig. 352: Identifying Control Plunger Parts
Courtesy of BMW OF NORTH AMERICA, INC.

OIL FILTER AND LINES

11 42 020 REMOVING AND INSTALLING COMPLETE FULL-FLOW OIL FILTER (M52 / S52 / M52TU / M54 / M56)

Remove intake air housing with air-mass flow sensor.

Unfasten oil filter cover to allow oil to flow out of main flow oil filter housing and back into oil pan.

This operation is described in the section **00 00... ENGINE OIL SERVICE** .

Remove **GENERATOR** .

If necessary, empty supply tank for power steering.

If necessary, remove supply tank (lines remain connected).

If necessary, remove vane pump for power steering (lines remain connected).

If necessary, remove alternator drive belt tensioner.

Remove connector for oil pressure switch.

If necessary, disconnect plug for oil temperature switch.

Disconnect oil pressure line for VANOS adjustment unit from oil filter housing.

Unfasten screws and remove complete full-flow oil filter.

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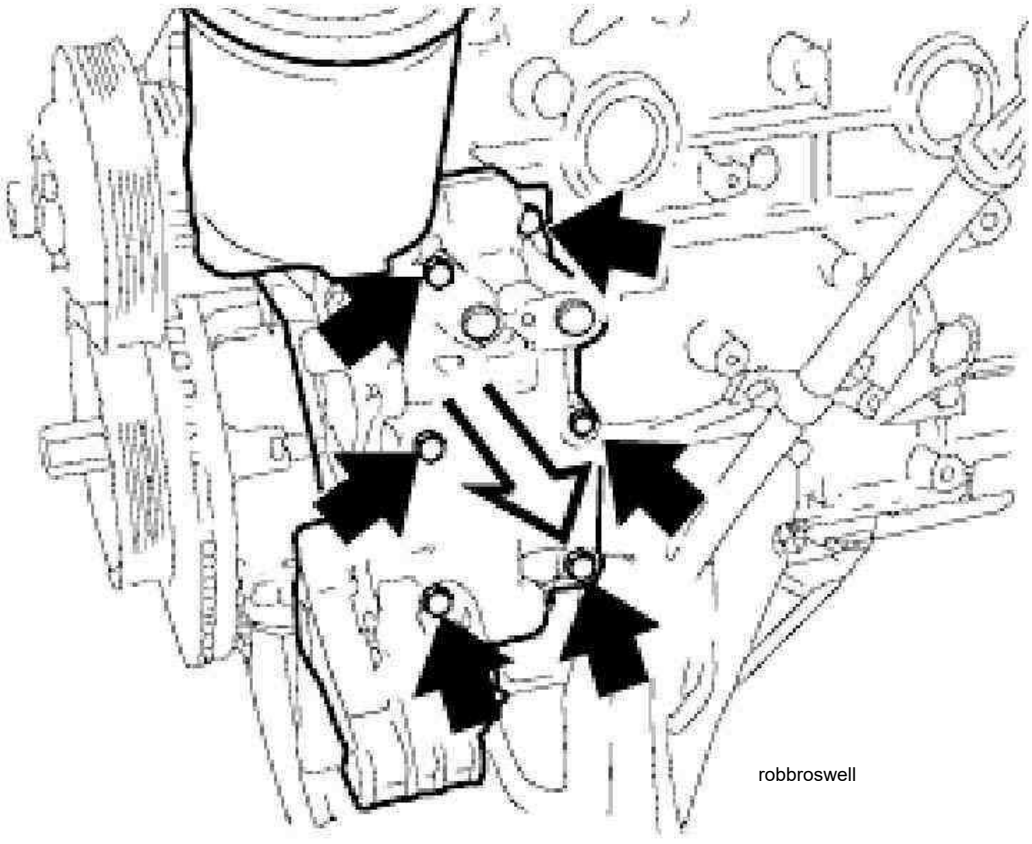


Fig. 353: Removing Complete Full-Flow Oil Filter
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Check dowel sleeves for damage and correct installation position.

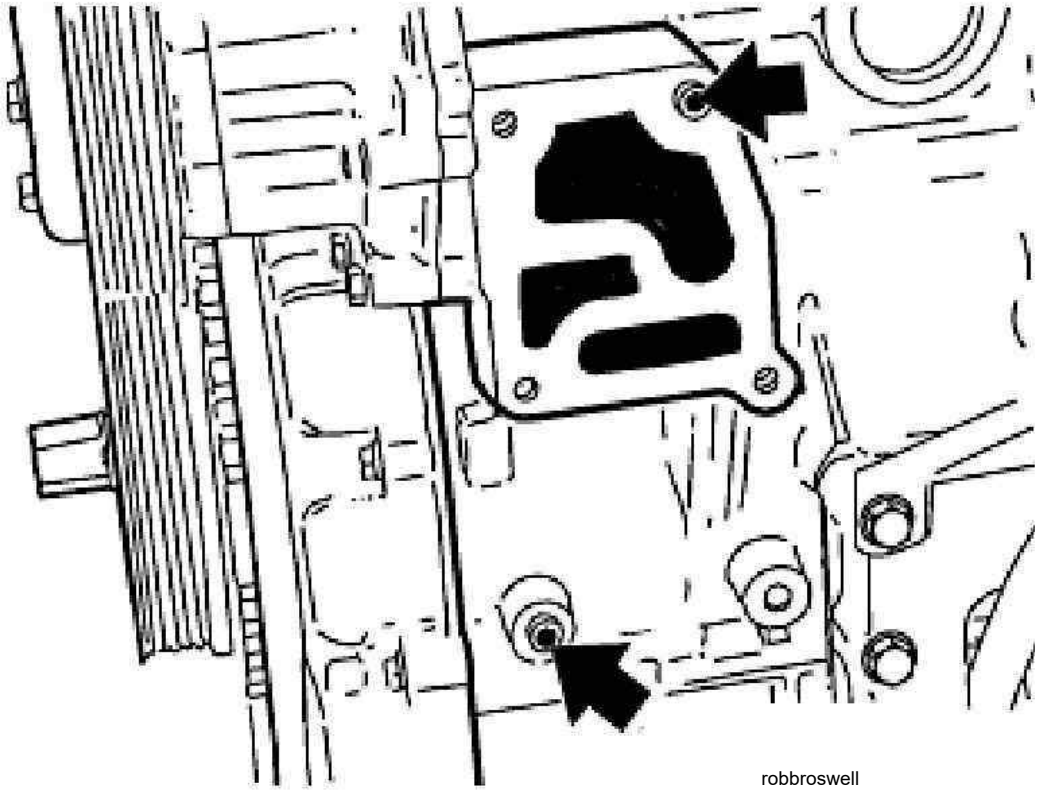


Fig. 354: Checking Dowel Sleeves For Damage And Correct Installation Position
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace seal.

Top up engine oil.

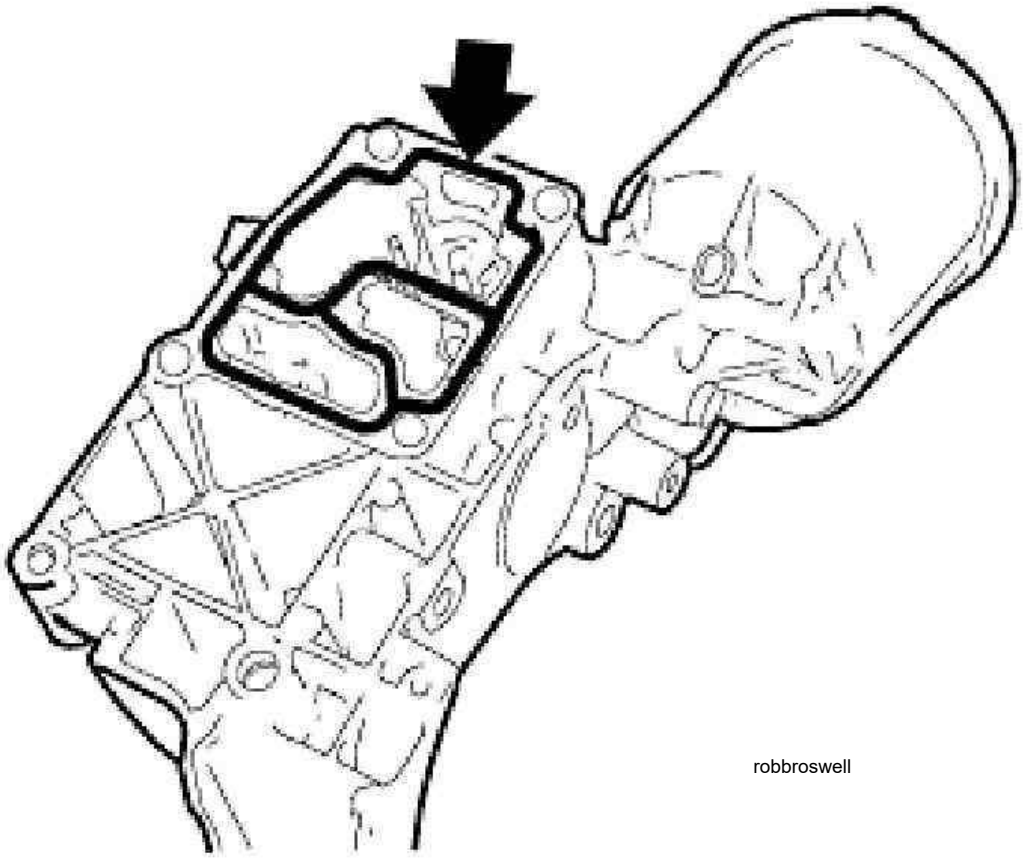


Fig. 355: Replacing Seal
Courtesy of BMW OF NORTH AMERICA, INC.

WATER PUMP WITH DRIVE

11 51 000 REMOVING AND INSTALLING/REPLACING WATER PUMP (M54)

Necessary preliminary tasks:

- Remove suction filter housing .
- Remove alternator drive belt . See **GENERATOR DRIVE BELT** .
- Secure engine in installation position with special tool .

Drain and dispose of coolant . See **17 00 005 DRAINING OFF AND TOPPING UP COOLANT** .

Installation:

Replace seal.

Tightening torque, see 11 11 5AZ in **ENGINE - TIGHTENING TORQUES** .

Vent cooling system and check for leaks.

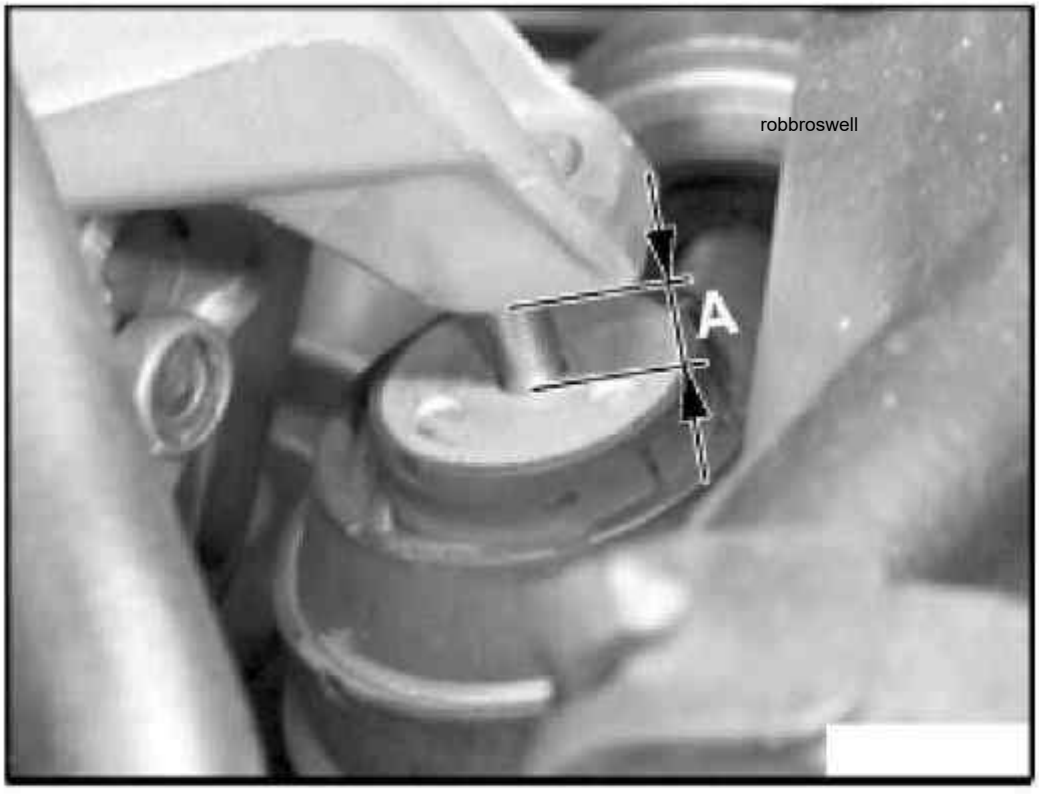
Release engine mount at top left.

Installation:

Tightening torque, see 22 11 1AZ in **ENGINE - TIGHTENING TORQUES** .

Raise engine with special tool approx. 3 cm to ensure removal of water pump.

Measurement A = 3 cm



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Fig. 356: Releasing Engine Mount At Top Left
Courtesy of BMW OF NORTH AMERICA, INC.

Release nuts and remove belt pulley.

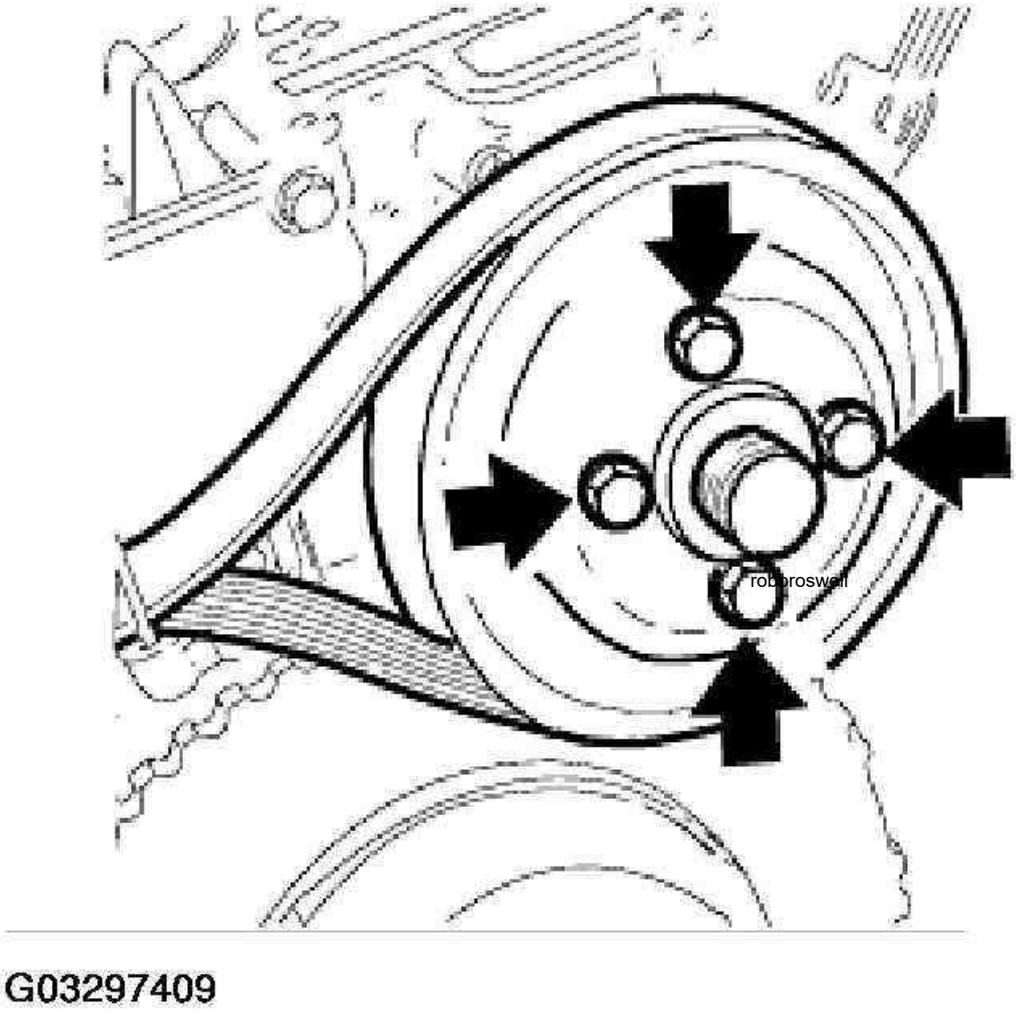


Fig. 357: Removing Belt Pulley
Courtesy of BMW OF NORTH AMERICA, INC.

Unscrew nuts.

Tighten two screws (M 6) into thread (1) of water pump (2) and press water pump uniformly out of timing case.

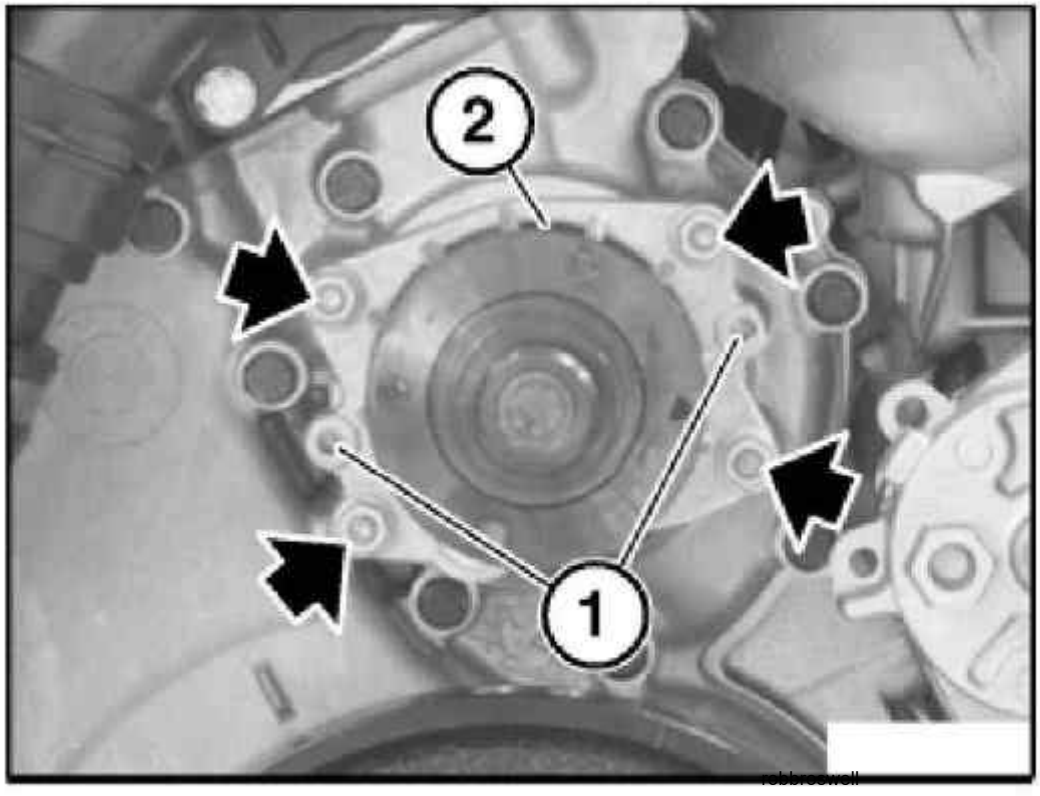


Fig. 358: Tightening Water Pump Screws
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Replace sealing ring (1) and coat with antiseize agent.

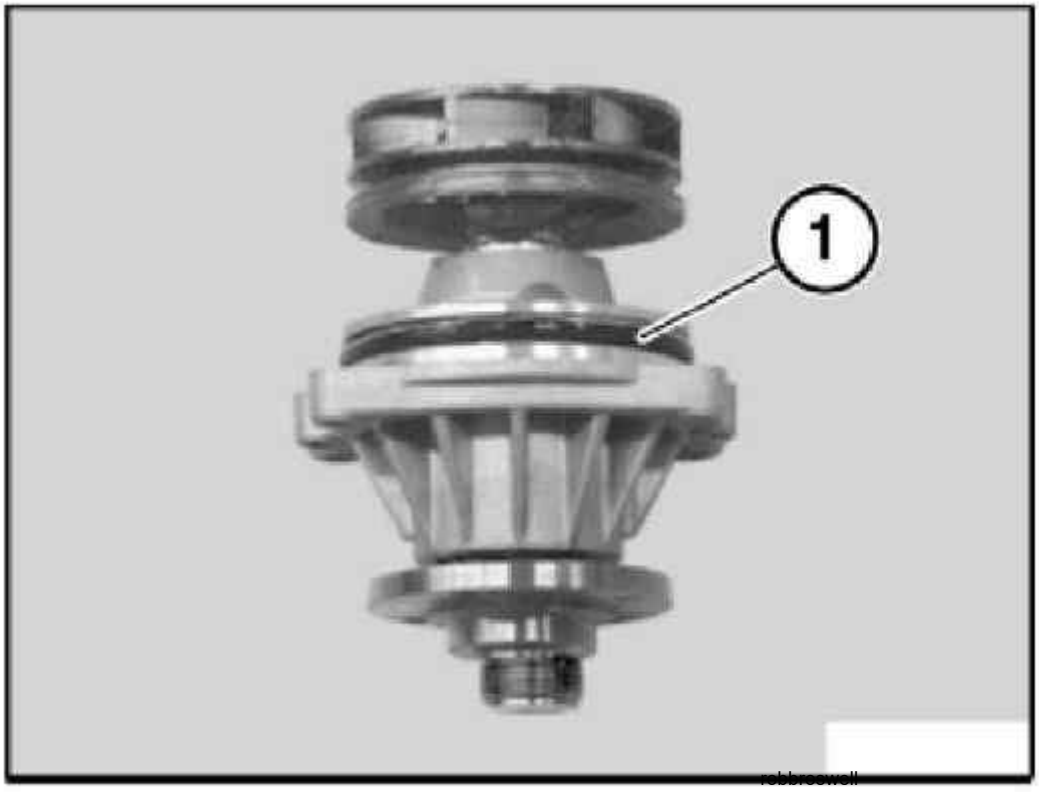


Fig. 359: Replacing Sealing Ring And Coating With Antiseize Agent
Courtesy of BMW OF NORTH AMERICA, INC.

THERMOSTAT AND CONNECTIONS

11 53 000 REMOVING AND INSTALLING/REPLACING COOLANT THERMOSTAT (M54)

Necessary preliminary tasks:

- Remove radiator cover . See **RADIATOR COVER** .
- Remove fan cowl . See **FAN COWL** .
- Drain off and top up coolant . See **17 00 005 DRAINING OFF AND TOPPING UP COOLANT** .

Illustrations show E46.

Pull locks and disconnect water hoses.

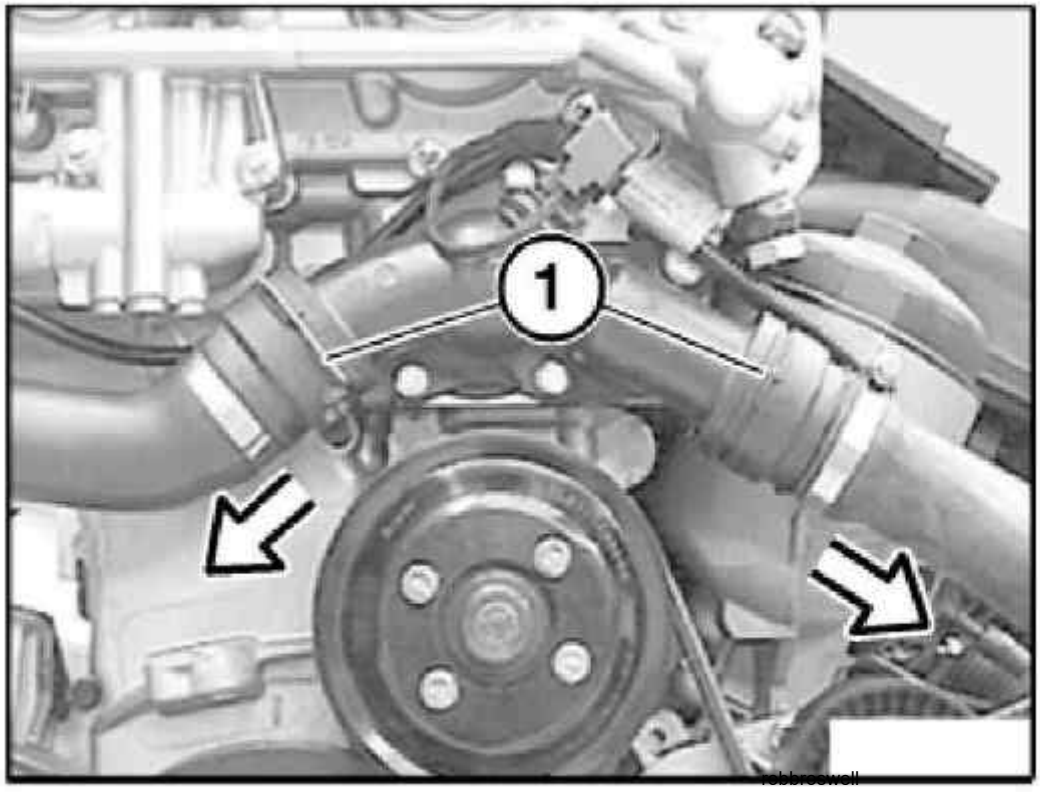


Fig. 360: Disconnecting Water Hoses
Courtesy of BMW OF NORTH AMERICA, INC.

Loosen nut (1).

Release screws on thermostat housing, remove thermostat housing.

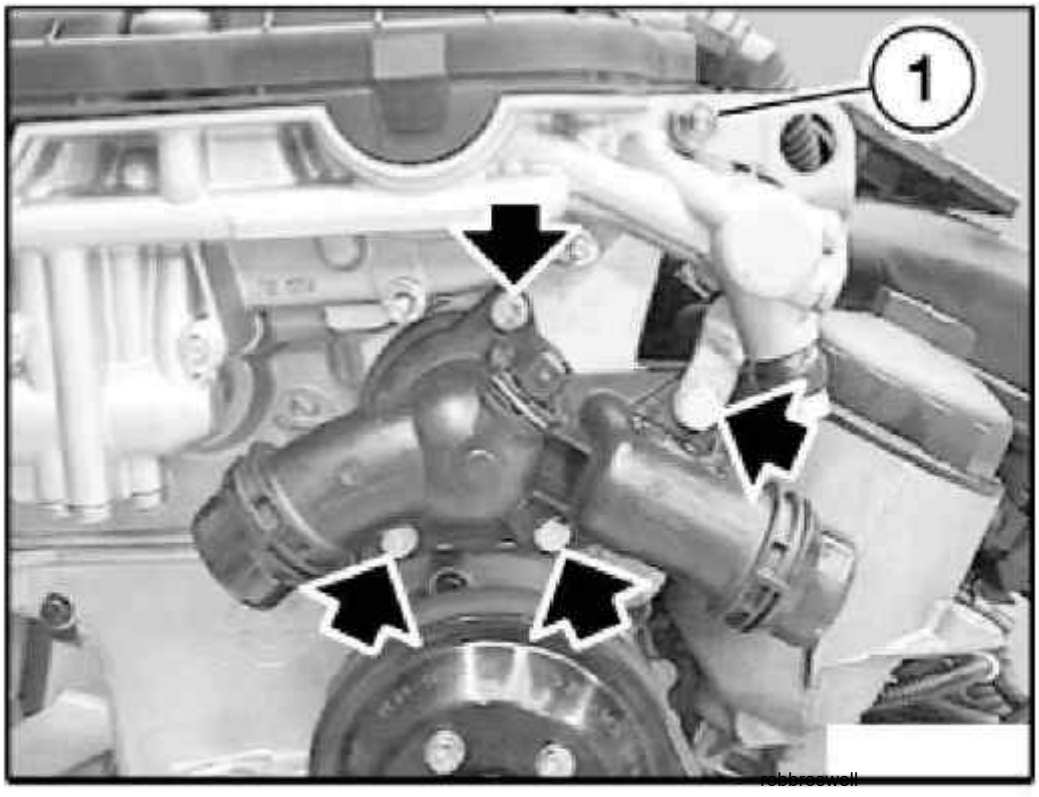


Fig. 361: Removing Thermostat Housing
Courtesy of BMW OF NORTH AMERICA, INC.

Installation:

Keep sealing faces clean and free of oil.

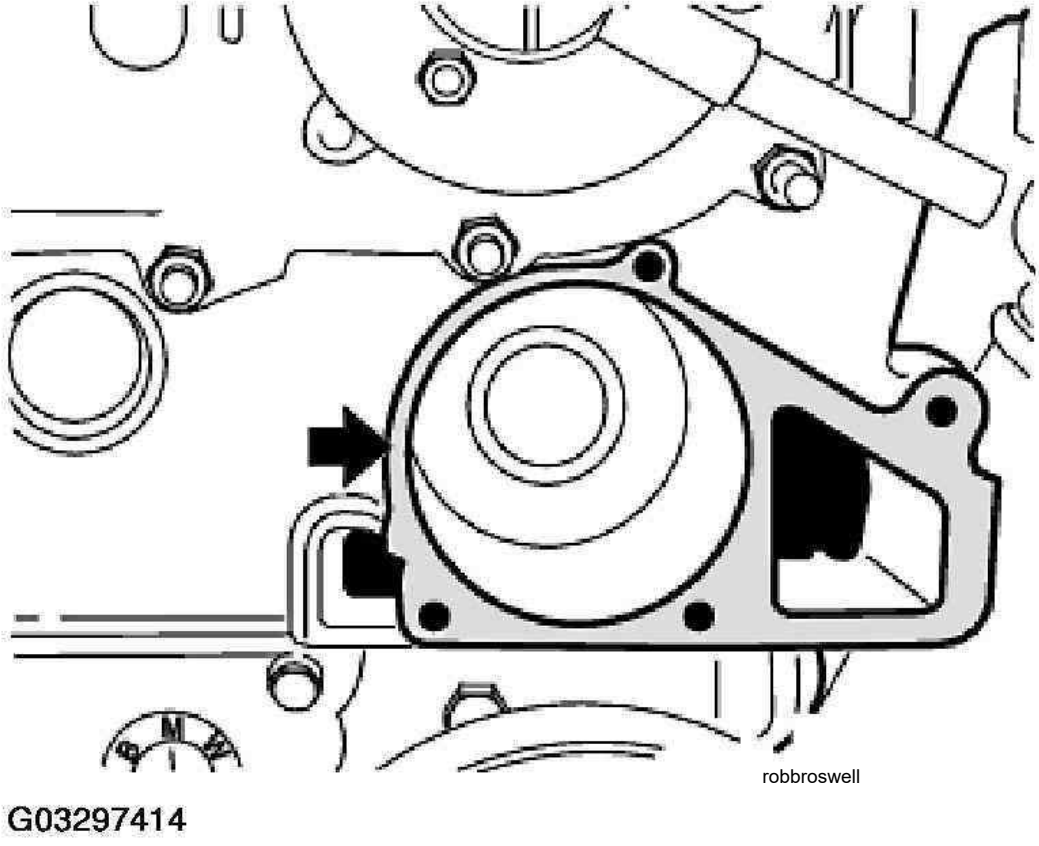


Fig. 362: Identifying Seal
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: The coolant thermostat is integrated in the coolant thermostat housing and can only be replaced as a complete unit.

Installation:

Replace gasket (1).

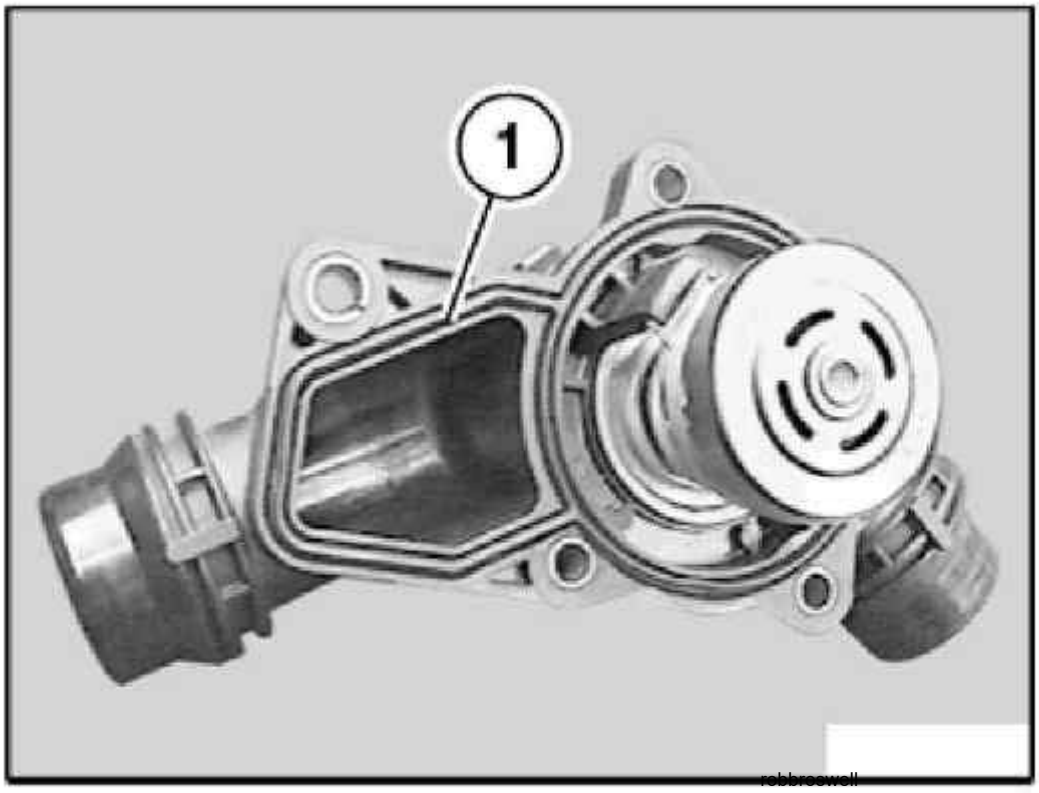


Fig. 363: Replacing Gasket
Courtesy of BMW OF NORTH AMERICA, INC.

INTAKE MANIFOLD

11 61 050 REMOVING AND INSTALLING INTAKE AIR MANIFOLD (M54)

Necessary preliminary tasks:

- Instructions for disconnecting and connecting battery .

  Disconnect negative battery lead.

- Remove engine cover .
- Remove left tension strut . See **51 23 265 REMOVING AND INSTALLING/REPLACING LEFT AND RIGHT GAS STRUT SHOCKS** .
- Remove intake filter top section .

- Remove intake pipe .
- Remove sound generator .

IMPORTANT: Do not mix up oxygen monitor sensors for cylinders 1 to 3 and 4 to 6 at plug connection to wiring harness. Mark plug connections.

Unclip plug connections (1) from holders.

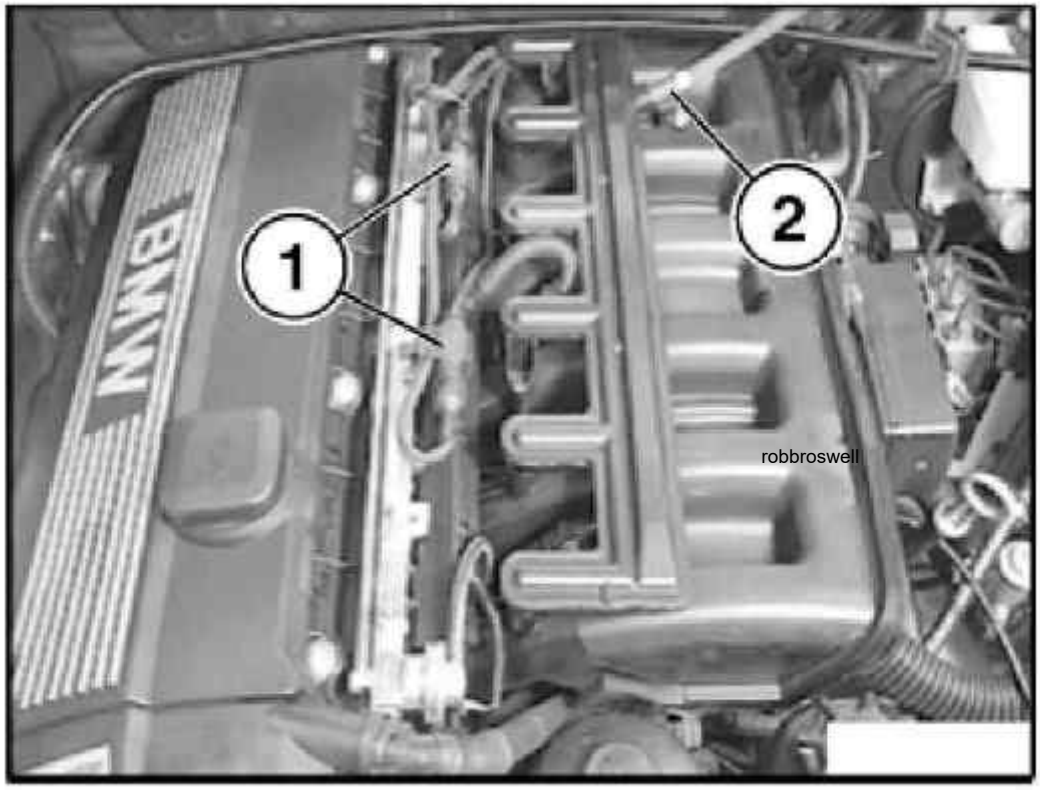


Fig. 364: Uncliping Plug Connections From Holders
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and detach vent hose.

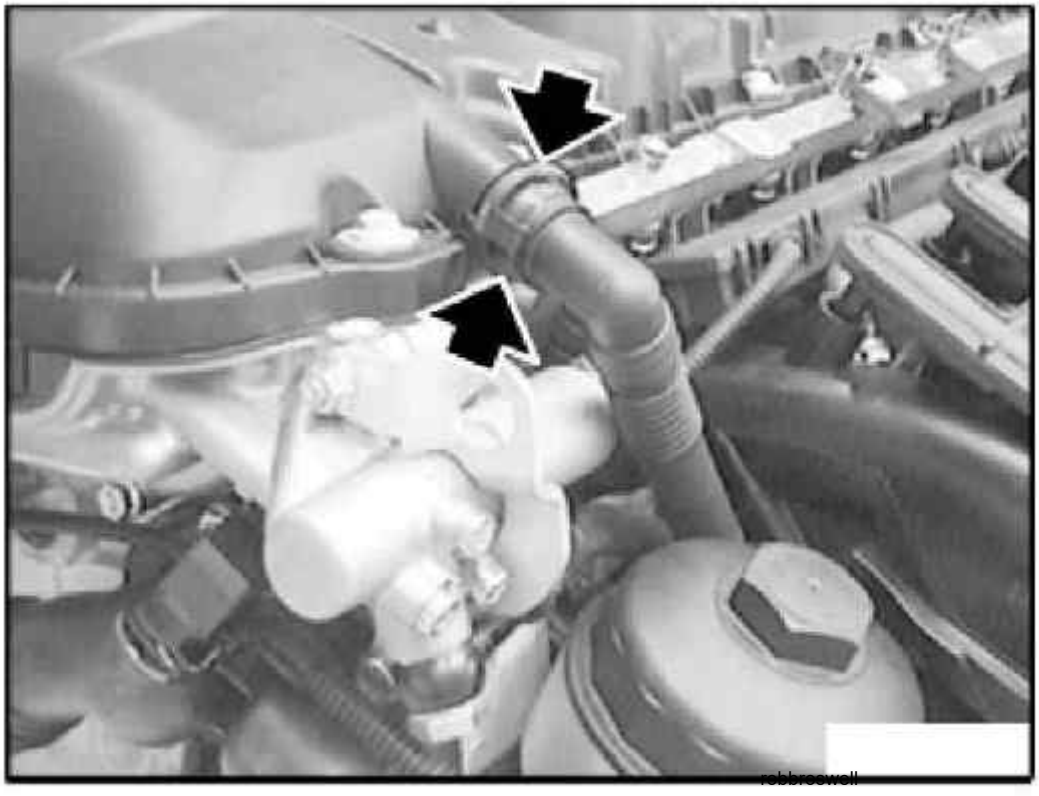


Fig. 365: Detaching Vent Hose
Courtesy of BMW OF NORTH AMERICA, INC.

Remove clips (1).

Detach terminal strip (3) from fuel injectors and place to one side.

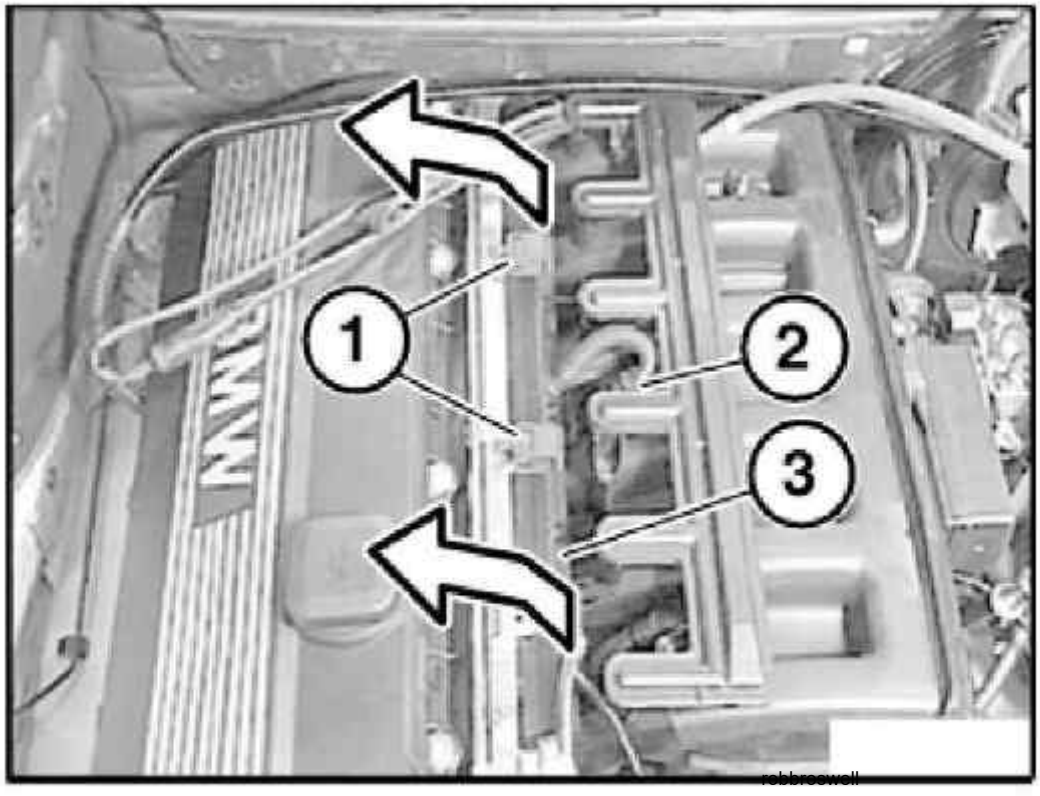


Fig. 366: Detaching Terminal Strip From Fuel Injectors
Courtesy of BMW OF NORTH AMERICA, INC.

NOTE: For a better overview, this work step is shown on an engine that has been removed.

IMPORTANT: Catch and dispose of fuel as it escapes.

Instructions for removing and installing fuel hoses.

Unclip fuel line (1) from holder (2).

Unlock and detach fuel line (1).

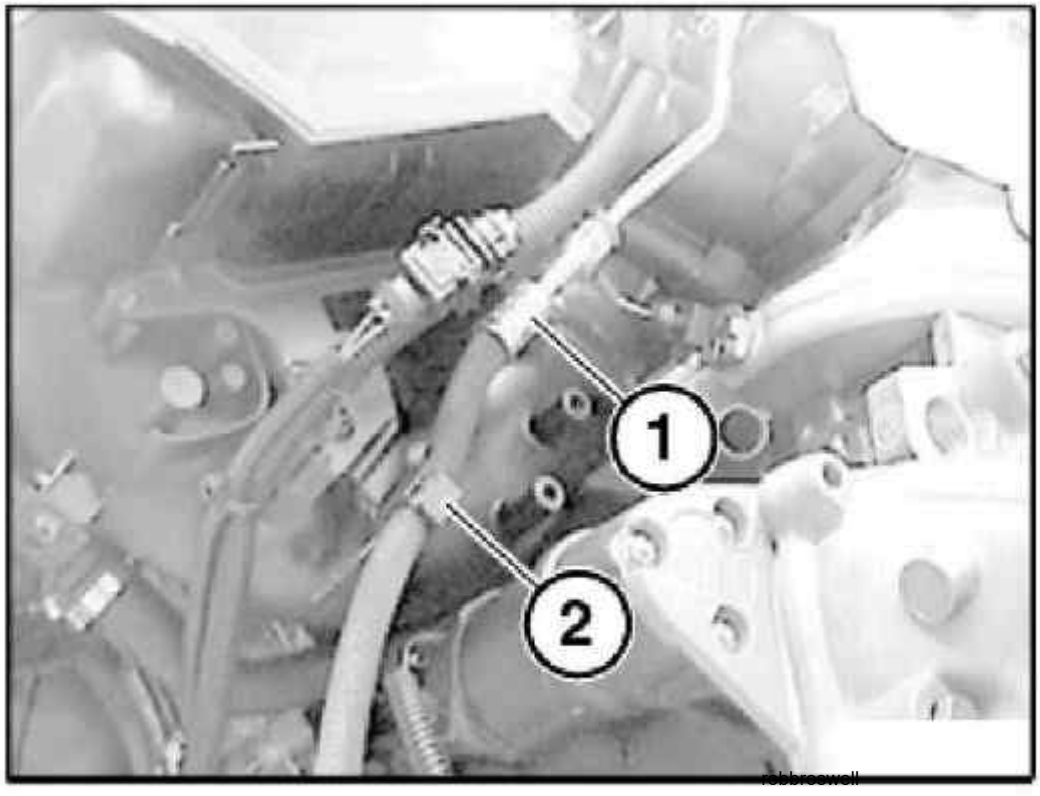


Fig. 367: Uncliping Fuel Line From Holder
Courtesy of BMW OF NORTH AMERICA, INC.

Disconnect plug connection (1) on tank venting valve.

Remove tank venting valve from retainer (2) on manifold.

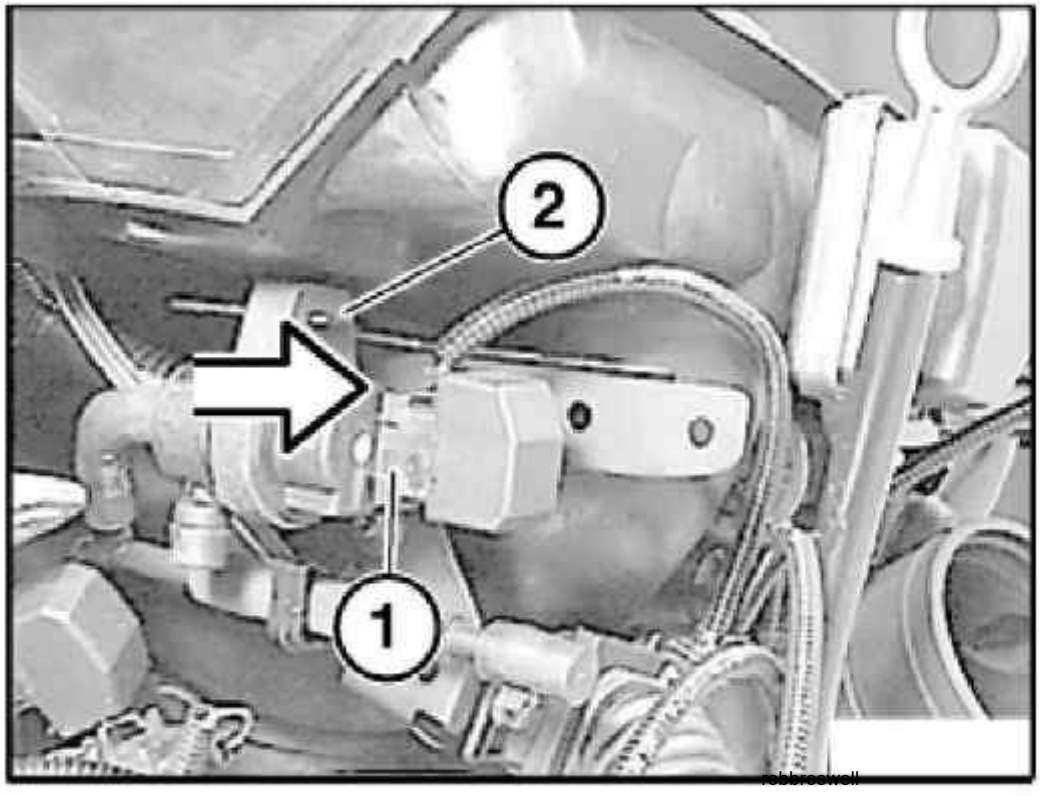


Fig. 368: Removing Tank Venting Valve From Retainer On Manifold
Courtesy of BMW OF NORTH AMERICA, INC.

Press lock and detach return line from oil dipstick guide tube.

Unclip plug connection (1) for knock sensors from holder.

Release nut (2) on manifold support.